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NUEXCO

Monthly Report

June 1990 Number 262

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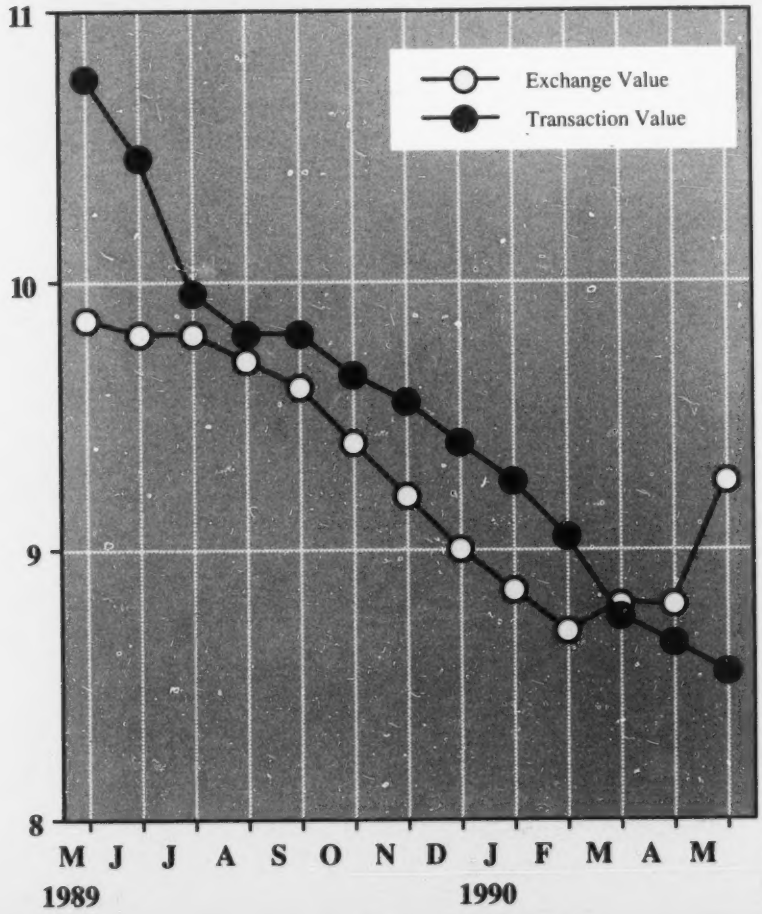
Financing Uranium Exploration and Development Projects 21

Electricité de France 29



NUEXCO

International Headquarters

Oren L. Benton – Chairman and Chief Executive Officer
Earl E. Hoellen – President and Chief Operating Officer

Three Park Central, Suite 900
1515 Arapahoe Street
Denver, Colorado 80202 USA

Telephone: (303) 899-4500
Telefax: (303) 899-4555
Telex: 450202 (NUEXCO)

Service Locations

DENVER, COLORADO, USA

Three Park Central, Suite 900
1515 Arapahoe Street
Denver, Colorado 80202
Telephone: (303) 899-4500
Telefax: (303) 899-4555
Telex: 450202 (NUEXCO)

WASHINGTON, D.C., USA

11 Dupont Circle, Suite 505
Washington, D.C. 20036
Telephone: (202) 328-9250
Telefax: (202) 328-6699
Telex: 451691 (NUEXCO DC)

ZURICH, SWITZERLAND

Leberngasse 15
4603 Olten
Switzerland
Telephone: (41-62) 320032
Telefax: (41-62) 321450
Telex: 981600 (NUXCH)

SAN FRANCISCO, CALIFORNIA, USA

Building 1, Suite 105
3000 Sand Hill Road
Menlo Park, California 94025
Telephone: (415) 854-1510
Telefax: (415) 854-2115
Telex: 470674 (NUEXCO SF)

HONG KONG

1403 Shui On Centre
6-8 Harbour Road, Wanchai
Hong Kong
Telephone: (852-5) 865-1418
Telefax: (852-5) 865-2721
Telex: 67206 (CNITC)

GENEVA, SWITZERLAND

13 chemin du Levant
01210 Ferney-Voltaire
France
Telephone: (33-50) 428035
Telefax: (33-50) 428526
Telex: 385288 (NUEXCO F)

Service Entities

NUEXCO Trading Corporation	Earl E. Hoellen, President
NUEXCO Information Services Company	Earl E. Hoellen, President
NUEXCO Transportation & Services Company ("NuTranS")	Robert L. Bovey, President
NUEXCO Asia, Limited	Gerald L. Murdock, Managing Director
NUEXCO Exchange AG	Hans W. Vogt, Managing Director

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Managing Editor:
R. Wesley Miller

Director-Market Analysis:
Treva E. Klingbiel

Editor:
France Addington-Lee

Supply Analysis:
Thomas C. Pool

Demand Analysis:
John M. Vallance

Market Analysis:
David S. Schramm

Research Services:
Carolyn B. McCants

Subscription Services:
Lori A. Mattics

Washington Focus:
Linda L. Gunter

Editorial Assistants:
Karsten D. Lindberg
Alan L. Wolcott

Published by:
NUEXCO
Three Park Central, Suite 900
1515 Arapahoe Street
Denver, Colorado 80202
Telephone: (303) 899-4500
Telefax: (303) 899-4555
Telex: (303) 450202 (NUEXCO)

Other NUEXCO Publications:
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• **Financing Uranium Exploration and Development Projects in the 1990s** — The dramatic changes in the uranium industry in the past decade have made future exploration and development projects uncertain. In a recent speech to the Canadian Institute of Mining and Metallurgy, Dustin J. Garrow of NUEXCO addressed the need for new projects and some of the alternatives available for financing them.

Focus 29

• **Electricité de France** — Electricité de France (EdF), under the leadership of Pierre Delaporte, has become one of the most progressive organizations in the nuclear power industry. In recent years, EdF has adopted a newly aggressive, innovative attitude toward international market opportunities.

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To Our Readers

NUEXCO announces the May 31 retirement of James G. Munro, who has been our representative in Australia since early 1987. Jim has made invaluable contributions to our organization, and we extend him our best wishes for the future. A new organizational arrangement for NUEXCO's presence in the Australian market will be announced soon.

* * *

We would also like to draw your attention to format changes that have been implemented beginning with this issue of the Monthly Report. The separate Executive Summary and Figures of the Month insert has been discontinued. The information contained in these sections has been retained and is located within the Market Review section. We hope you will find these reformatting changes result in a clearer and more concise presentation of market activity.

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MARKET VALUES SUMMARY
May 31, 1990

NUEXCO Market Values	This Report May 31, 1990	Last Report April 30, 1990	12 Months Ago May 31, 1989
EXCHANGE VALUE [1]	**$9.25** / lb equivalent U_3O_8	$8.80	$9.85
UF_6 VALUE [2]	**$25.50**/ kg U as UF_6	$24.40	$30.25
LOAN RATE [3]	**3.5 %**/annum	3.5%	3.5%
CONVERSION VALUE [4]	**$1.45** / lb U as UF_6	$1.45	$1.95
SWU VALUE [5] **(0.3 tails assay)**	**$50** /SWU	$50	$66
TRANSACTION VALUE [6]	**$8.55** / lb equivalent U_3O_8	$8.65	$10.75
Transactions	**27**	24	31
Months	**3**	3	3
million pounds	**9.9**	8.4	7.1

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:
a. Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b. At least ten transactions;
c. Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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MARKET REVIEW

MAY MARKET REVIEW

(as of May 31, 1990)

NATURAL URANIUM AND CONVERSION

Short-term Market Activity

Both the Exchange Value and the UF6 Value increased significantly on May 31, 1990, marking the first time since October 1987 that both Values have increased. It also marks the first time in exactly five years that the Exchange Value and the UF6 Value have both increased by approximately five percent in the same month. Over four million pounds equivalent U_3O_8 changed hands in May's eleven near-term natural uranium sales. Six involved concentrates, five involved natural UF6 (**Table 1**), and the closing prices fell within a wide range (88% to 107% of the Exchange Value or UF6 Value).

Prices tended to increase throughout the month, as both buyers and sellers began to sense that a general strengthening of the natural uranium market may be underway. The uranium market is in transition, and as a result, uncertainty in the market is greater than normal. Furthermore, geographical differences in market conditions are aggravating this uncertainty.

The May 31 **Exchange Value** increased for the second time in three months, rising sharply to **$9.25** per pound U_3O_8, up $0.45 (a 5.1 percent increase) from the April 30 Exchange Value. This is the first time since July 31, 1985 that the Exchange Value has risen by five percent or more in a single month. Six concentrates sales totalled over 1.5 million pounds equivalent U_3O_8 and occurred at prices that varied widely around the May 31 Exchange Value. This diversity of price levels was due to the upward price movement during the month, and to the difference between market conditions in Europe and North America. Demand is lower in Europe, so buyers can be more selective and command lower prices from aggressive sellers. In North America, higher demand and tighter supply have enabled some sellers to command prices above the May 31 Exchange Value in recent sales.

The **UF6 Value** increased for the first time since October 1987, jumping $1.10 to **$25.50** per KgU as UF6. This increase of 4.5 percent is the largest increase in the UF6 Value since May 31, 1985, which was only the second month of its publication. Intermediaries sold a total of 2.5 million pounds equivalent U_3O_8 in May's five spot natural UF6 sales. The dichotomy between market conditions in Europe and North America is even more pronounced for UF6. Lower demand, high inventories, and aggressive competition have kept UF6 prices lower in Europe. In contrast, the UF6 glut that has been prevalent in North America in recent months has been reduced significantly. As a result, North American UF6 buyers, particularly those imposing special restrictions, may have to settle for prices above the May 31 UF6 Value, and may receive even higher offers.

* * *

The **Transaction Value** declined to **$8.55** per pound U_3O_8 based on 27 transactions over 3 months involving 9.9 million pounds. When UF6 sales are included in the calculation of the Transaction Value, the effective prices of their U_3O_8 components reflect the market's discount or premium for UF6. (Explained in detail last month—Report No. 261, pages 2-3.) Under current market conditions, UF6 is selling at a discount relative to the sum of the

Table 1
SPOT URANIUM SALES SUMMARY

	May 1990		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	6	1.7	23	7.2
UF6	5	2.5	15	8.0
EUP	2	1.0	8	3.9
Total	13	5.2	46	19.1

[1] Million Pounds Equivalent U_3O_8

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values of its components—concentrates and conversion. Thus, the concentrates component of a UF_6 sale is discounted when used to calculate the Transaction Value and contributes to holding the Transaction Value below the Exchange Value. However, if UF_6 were selling at a premium relative to the sum of the values of its components, UF_6 sales would tend to hold the Transaction Value above the Exchange Value.

The May 31 Transaction Value also lags the Exchange Value because the qualifying transactions from May, April, and March are all included in the calculation. These sales, which were concluded at the market's previously lower levels, contribute to the lower Transaction Value.

* * *

Active uranium supply increased to **3.5** million pounds equivalent U_3O_8, while **active uranium demand** declined to **3.7** million pounds equivalent U_3O_8 (**Table 2**). The resultant **supply/demand ratio** is **0.9**. Subject to geographical variances, demand exceeds supply for the third consecutive month. However, recent history has demonstrated that price increases bring previously unidentified supply sources into the market each month as necessary to meet demand. On the other hand, although new supply enters the market as expected, some current supply sources tighten in anticipation of higher prices in the future. So uncertainty again prevails in today's transitory market.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]	Active Demand [1]
• Natural Uranium [2] (thousand lbs equivalent U_3O_8)	3,475	3,670
• Supply/Demand Ratio:	0.9	
• Loans (thousand lbs equivalent U_3O_8)	7,210	0
• Conversion (thousand lbs U as UF_6)	150	1,500
• SWU (thousand SWUs)	935	165

[1] Supply and demand tables in the current market data section of this Report provide details for each category.
[2] Includes concentrates and hexafluoride.

* * *

Long-Term Market Activity

Five long-term uranium sales are reported this month, two of which occurred in 1989. Producers sold over nine million pounds equivalent U_3O_8 in the three May sales. Most of these sales utilized either base-price escalated or market-related pricing terms. The recent upward trend in spot prices has also been paralleled by a rise in prices for deliveries beyond 12 months.

* * *

The **Loan Rate** remained at **3.5** percent per annum. Six natural uranium loans, three involving UF_6, and three involving concentrates, were concluded in May. Three of the loans occurred at or near the May 31 Loan Rate; the remaining loans were portions of more complex transactions and involved special considerations. When those considerations are appraised, the loans can be evaluated at levels near the Loan Rate.

The six loans totalled nearly 2.5 million pounds equivalent U_3O_8; the UF_6 loans totalled nearly one million pounds, and three concentrates loans made up the balance of the volume. Four of the six lenders are located in Europe; the majority of the borrowers are from the USA.

* * *

The **Conversion Value** remained unchanged at **$1.45** per pound U as UF_6. Two European buyers purchased conversion services for nearly one million pounds of U as UF_6 from intermediaries, for prices at or near the May 31 Conversion Value. The downward pressure on secondary conversion services has alleviated somewhat. However, the geographical differences in the uranium market are now beginning to affect conditions in the conversion market and inquiries for secondary conversion services reflect price level expectations that differ between North America and Europe.

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MARKET REVIEW

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** has not changed since February 28, 1990, remaining at **$50** per SWU. Four spot SWU sales took place in May at or near the prevailing SWU Value. The sales totalled nearly 400 thousand SWU, with European entities as the buyers and sellers in three of the transactions. SWU supply seemed to tighten temporarily during the month, but large quantities of excess SWU inventories are known to exist. One long-term SWU sale also occurred in May for almost 1.7 million SWU in EUP using base-price-escalated terms.

Two utilities purchased a total of nearly one million pounds equivalent U_3O_8 in EUP in two near-term sales that also occurred in May. ■

Table 3
ENRICHMENT PRICES
(May 31, 1990)

Prices	This Month Report 262	Last Month Report 261	12 Months Ago Report 250
NUEXCO SWU Value ($US per SWU)	50	50	66
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.00[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP1)	90.00[4]	90.00[4]	90.00[4]
Calculated worth of enriched UF_6[5]: ($US per kg U as UF_6)			
2.5 w/o U_{235}	274	267	328
3.0 w/o U_{235}	351	343	423
3.5 w/o U_{235}	430	421	520
4.0 w/o U_{235}	510	500	619

[1] Effective 10/1/89 to 9/30/90.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] Effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
DOE chose to waive application of the GNP deflator for FY87–FY90 deliveries.
[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

URANIUM SALES[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U_3O_8 equivalent)	Approximate Price Range[2] as Percent of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
4826	1993 - 1998	1,001 - 3,000	See Remarks	Utility	Producer	Occurred in 1989, Price Related to Market
4827A	1990 - 1999	5,001 - 10,000	R[3]	Utility	Producer	Contained in EUP
4829	1992 - 1994	601 - 1,000	See Remarks	Utility	Producer	Price Related to Market
4830	1993 - 1998	601 - 1,000	R[3]	Utility	Producer	Occurred in 1989
4831	1990	301 - 600	98 - 102	Utility	Intermediary	
4832	1991	601 - 1,000	88 - 92	Utility	Intermediary	UF_6
4833	1990	Less than 50	88 - 92	Utility	R[3]	
4834	1990	101 - 300	98 - 102	Producer	Intermediary	
4835	1990	101 - 300	93 - 97	Utility	Intermediary	UF_6
4836	1990	101 - 300	98 - 102	R[3]	Producer	
4839	1991	101 - 300	103 - 107	Producer	Intermediary	
4840	1990	1,001 - 3,000	93 - 97	Utility	Intermediary	UF_6
4841A	1990	601 - 1,000	R[3]	Utility	R[3]	Contained in EUP
4844	1991	301 - 600	93 - 97	Intermediary	Intermediary	UF_6
4847A	1990	101 - 300	R[3]	Utility	R[3]	Contained in EUP
4848	1990	101 - 300	98 - 102	Intermediary	Intermediary	UF_6
4853	1992 - 1995	301 - 600	R[3]	R[3]	Producer	
4855	1990	101 - 300	103 - 107	Utility	R[3]	

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.
[2] The range reflects five percentage points (inclusive) per grouping, centered about the middle of the range.
[3] The notation R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

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MARKET REVIEW

URANIUM LOANS[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U_3O_8 equivalent)	Approximate Price Range[2] as Percent of Current Loan Rate	Borrower	Lender	Remarks
4824	1990	301 - 600	98 - 102	R[3]	Producer	UF_6
4825	1990	101 - 300	98 - 102	Intermediary	Utility	UF_6
4837	1990	301 - 600	R[3]	Intermediary	R[3]	UF_6
4849	1990	601 - 1,000	R[3]	Intermediary	Utility	Concentrates
4851	1990	301 - 600	113 - 117	Intermediary	Producer	Concentrates
4854	1990	101 - 300	98 - 102	Intermediary	Producer	Concentrates

CONVERSION SERVICES SPOT MARKET SALES[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Approximate Price Range[2] as Percent of Current C.V.	Buyer	Seller	Remarks
4845	1990	301 - 600	98 - 102	Utility	Intermediary	
4846	1990 - 1991	301 - 600	98 - 102	Utility	Intermediary	

ENRICHMENT SERVICES SECONDARY MARKET SALES[1]

NUEXCO Transaction Period	Delivery	Approximate Quantity[4] (thousand SWUs)	Approximate Price Range[2] as Percent of Current SWU Value[5]	Buyer	Seller	Remarks
4827B	1990 - 1999	1,001 - 3,000	R[3]	Utility	Producer	Contained in EUP
4838	1990	101 - 300	98 - 102	Intermediary	Utility	
4841B	1990	101 - 300	R[3]	Utility	R[3]	Contained in EUP
4842	1990	50 - 100	98 - 102	Utility	Intermediary	
4847B	1990	50 - 100	R[3]	Utility	R[3]	Contained in EUP

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.
[2] The range reflects five percentage points (inclusive) per grouping, centered about the middle of the range.
[3] The notation R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.
[4] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.
[5] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

URANIUM SUPPLY
(May 31, 1990)

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale				
ACTIVE				
89-1201	1,300	2,000 per year	1990 - 1993	
90-1078A*	2,175	2,175 per year	1991 - 1993	UF_6e
90-1027*	—	1,300 per year	1991-2000	
Total	**3,475**			
INACTIVE				
89-1076	500	250 per year	1990 on	
89-1156	200	—	1990	
89-1180	1,000	—	1990	
87-1123	—	1,000 per year	1990 on	
88-1157	—	1,000 per year	1990 on	UF_6
Total	**1,700**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Projects removed since last month: 87-1000, 89-1173, 89-1209.

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MARKET REVIEW

URANIUM DEMAND
(May 31, 1990)

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Inquiries to Purchase:				
ACTIVE				
90-1038*	520	—	1990	
90-1077*	500	—	1990 - 1991	
90-1100A	45	—	1991	UF6e
90-1113*	185	525 per year	1991 - 1995	U_3O_8/UF6
90-1114*	75	—	1990	U_3O_8/UF6
90-1119*	195	—	1990	UF6
90-1120*	30	105 per year	1991 - 1992	UF6
90-1121*	500	—	1990	U_3O_8/UF6
90-1125*	720	—	1990 - 1991	U_3O_8/UF6
90-1126*	350	—	1991	
90-1138*	350	—	1990	
90-1139*	200	—	1990	
89-1233	—	160	1991	UF6
90-1024	—	250 per year	1992 - 2001	
90-1092A	—	325	1991 - 1992	UF6e
90-1093A	—	390	1991 - 1992	UF6e
90-1098	—	250 per year	1992 - 1994	
90-1111*	—	390	1992	UF6
Total	**3,670**			
INACTIVE				
89-1067	500	—	1990	
89-1175	170	170 per year	1990 - 1991	
90-1045A	405	—	1991	UF6e
90-1099	265	—	1990	
90-1017	—	250	1991	
Total	**1,340**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Projects removed since last month: 89-1183, 90-1026, 90-1064, 90-1082, 90-1085A, 90-1102, 90-1103.

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LOAN SUPPLY AND DEMAND
(May 31, 1990)

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Within 1 Year[1]	Beyond 1 Year[1]	Remarks
Available for Loan			
ACTIVE			
88-1182	4,000	—	U_3O_8/UF_6
90-1016	300	—	U_3O_8
90-1033	1,270	—	UF_6
90-1108	1,000	—	U_3O_8
90-1110*	250	—	U_3O_8
90-1115*	390	—	UF_6
Total	**7,210**		
INACTIVE			
90-1031*	1,000	—	U_3O_8
90-1049	1,000	—	U_3O_8
Total	**2,000**		

Inquiries to Borrow:

No inquiries to borrow are reported

* New or revised since last month.
[1] Measured from the date of this Report.
Projects removed since last month: 90-1096.

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MARKET REVIEW

CONVERSION SUPPLY AND DEMAND
(May 31, 1990)

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years[1]	Beyond 3 Years[1]	Remarks
Available for Loan			
ACTIVE			
89-7002	150	—	
Total	**150**		
INACTIVE			
None reported			
Inquiries to Purchase			
ACTIVE			
90-1101	500	—	
90-1122*	845	—	
90-1137*	155	—	
Total	**1,500**		
INACTIVE			
None reported			

* New or revised since last month.
[1] Measured from the date of this Report.
Projects removed since last month: 90-1072, 90-1075.

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SWU SUPPLY AND DEMAND
(May 31, 1990)

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale				
ACTIVE				
90-1078B*	435	435 per year	1991 - 1993	UF6e
90-7000*	500	1,000	1990 on	
Total	**935**			
INACTIVE				
None reported				
Inquiries to Purchase				
ACTIVE				
90-1071	150	150 per year	1991 - 1996	
90-1100B	15	—	1991	UF6e
88-1061	—	500	1991 - 1995	
89-1262	—	120 per year	1996 - 1999	
90-1022A	—	235 per year	1996 - 1999	
90-1022B	—	900 per year	2000 - 2013	
90-1076	—	350 per year	1992 - 1998	
90-1092B	—	150	1991 - 1992	UF6e
90-1093B	—	200	1991 - 1992	UF6e
90-1094*	—	500	1992 - 2000	
90-1109*	—	170	1996	
Total	**165**			
INACTIVE				
90-1045B	95	—	1991	UF6e
90-1079*	1,450	—	1990	
89-1047	—	600	1991 - 1995	
Total	**1,545**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Projects removed since last month: 88-1082, 90-1035, 90-1052, 90-1073, 90-1080, 90-1085B.

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

EXCHANGE VALUE[1]

Country (currency)	per lb equivalent U3O8 as Concentrates			per kg U as Concentrates		
	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)
Australia (dollar)	11.98	11.69	13.16	31.14	30.40	34.21
Belgium (franc)	320.18	304.50	412.13	832.40	791.63	1,071
Canada (dollar)	10.88	10.24	11.89	28.28	26.62	30.91
EEC (ecu)	7.54	7.24	8.93	19.59	18.82	23.21
Finland (markka)	36.40	34.82	43.80	94.63	90.53	113.86
France (franc)	52.50	49.49	66.69	136.48	128.67	173.38
Italy (lira)	11,451	10,815	14,236	29,770	28,116	37,010
Japan (yen)	1,400	1,402	1,408	3,641	3,645	3,660
Netherlands (guilder)	17.52	16.59	22.18	45.55	43.13	57.66
So. Africa (comm. rand)	24.54	23.39	27.45	63.79	60.80	71.37
Spain (peseta)	965.65	933.29	1,261	2,510	2,426	3,278
Sweden (krona)	56.20	53.56	66.15	146.10	139.25	171.98
Switzerland (franc)	13.17	12.80	17.14	34.23	33.29	44.56
UK (pound)	5.45	5.38	6.28	14.18	13.99	16.32
US (dollar)	9.25	8.80	9.85	24.05	22.88	25.61
West Germany (mark)	15.57	14.77	19.67	40.47	38.39	51.14

TRANSACTION VALUE[1]

Country (currency)	per lb equivalent U3O8 as Concentrates			per kg U as Concentrates		
	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)
Australia (dollar)	11.07	11.50	14.36	28.79	29.88	37.34
Belgium (franc)	295.95	299.31	449.79	769.40	778.13	1,169
Canada (dollar)	10.06	10.06	12.98	26.14	26.16	33.73
EEC (ecu)	6.96	7.11	9.74	18.11	18.50	25.33
Finland (markka)	33.64	34.23	47.80	87.47	88.98	124.27
France (franc)	48.52	48.65	72.78	126.15	126.47	189.22
Italy (lira)	10,584	10,630	15,537	27,517	27,637	40,393
Japan (yen)	1,294	1,378	1,536	3,365	3,583	3,994
Netherlands (guilder)	16.20	16.31	24.21	42.11	42.39	62.93
So. Africa (comm. rand)	22.68	22.99	29.96	58.96	59.76	77.89
Spain (peseta)	892.58	917.38	1,376	2,321	2,385	3,577
Sweden (krona)	51.94	52.65	72.20	135.04	136.87	187.69
Switzerland (franc)	12.17	12.59	18.71	31.64	32.72	48.63
UK (pound)	5.04	5.29	6.85	13.11	13.75	17.81
US (dollar)	8.55	8.65	10.75	22.23	22.49	27.95
West Germany (mark)	14.39	14.52	21.47	37.41	37.74	55.82

[1]Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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CONVERSION VALUE[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)
Australia (dollar)	1.88	1.93	2.61	4.14	4.25	5.74
Belgium (franc)	50.19	50.17	81.59	110.65	110.61	179.87
Canada (doliar)	1.71	1.69	2.35	3.76	3.72	5.19
EEC (ecu)	1.18	1.19	1.77	2.60	2.63	3.90
Finland (markka)	5.71	5.74	8.67	12.58	12.65	19.12
France (franc)	8.23	8.15	13.20	18.14	17.98	29.11
Italy (lira)	1,795	1,782	2,818	3,957	3,929	6,213
Japan (yen)	219.53	231.00	278.69	483.98	509.27	614.41
Netherlands (guilder)	2.75	2.73	4.39	6.06	6.03	9.68
So. Africa (comm. rand)	3.85	3.85	5.43	8.48	8.50	11.98
Spain (peseta)	151.37	153.78	249.60	333.72	339.03	550.27
Sweden (krona)	8.81	8.83	13.10	19.42	19.46	28.87
Switzerland (franc)	2.06	2.11	3.39	4.55	4.65	7.48
UK (pound)	.85	0.89	1.24	1.88	1.95	2.74
US (dollar)	1.45	1.45	1.95	3.20	3.20	4.30
West Germany (mark)	2.44	2.43	3.89	5.38	5.36	8.59

SWU VALUE AND UF_6 VALUE[1]

Country (currency)	SWU Value at 0.30% Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)	This Month (May 31, 1990)	Last Month (Apr 30, 1990)	12 Months Ago (May 31, 1989)
Australia (dollar)	64.75	66.45	88.18	33.02	32.43	40.41
Belgium (franc)	1,731	1,730	2,762	882.66	844.29	1,266
Canada (dollar)	58.80	58.17	79.66	29.99	28.39	36.51
EEC (ecu)	40.73	41.13	59.81	20.77	20.07	27.41
Finland (markka)	196.75	197.85	293.46	100.34	96.55	134.50
France (franc)	283.77	281.20	446.85	144.72	137.23	204.80
Italy (lira)	61,897	61,448	95,390	31,567	29,986	43,720
Japan (yen)	7,570	7,966	9,433	3,861	3,887	4,323
Netherlands (guilder)	94.71	94.25	148.62	48.30	45.99	68.11
So. Africa (comm. rand)	132.63	132.87	183.95	67.64	64.84	84.30
Spain (peseta)	5,220	5,303	8,448	2,662	2,588	3,872
Sweden (krona)	303.77	304.32	443.25	154.92	148.51	203.15
Switzerland (franc)	71.17	72.75	114.84	36.30	35.50	52.63
UK (pound)	29.48	30.57	42.05	15.04	14.92	19.27
US (dollar)	50.00	50.00	66.00	25.50	24.40	30.25
West Germany (mark)	84.15	83.91	131.82	42.91	40.95	60.41

[1]Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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RECENT DEVELOPMENTS

USA

Smith Barney Report Released

The US Department of Energy (DOE) released on May 18 an executive summary of the independent financial study conducted by Smith Barney Harris Upham & Co. Inc. (Smith Barney) recommending the eventual privatization of the DOE enrichment program. DOE commissioned the assessment to obtain an objective view of the uranium enrichment enterprise (UEE) and an independent opinion as to the best way to maximize its financial value to the US Treasury. The report found the UEE constrained by pricing inflexibility, the government's short-term budget and planning process, conflicting congressional mandates and administration objectives, a lengthy and complex decision-making process, and a lack of a single, coordinated management structure.

Although Smith Barney recommends that the UEE ultimately become a true business enterprise in the private sector, it opposes UEE's immediate conversion to a private corporation. Because of the UEE's current organizational structure, unknown contingent liabilities, the lack of clear regulatory requirements for existing and new technology, uncertainties about the current spot market, and the lack of a commercial track record, its immediate privatization would result in a significantly less-than-optimal value to the Treasury, both in its sale price and annual cash flow.

To improve the UEE's competitiveness, the report recommends transferring the UEE to a newly-created government corporation, which can then be sold to the private sector to maximize the government's investment. To accomplish this objective, the new corporation must have "...an organizational structure and other corporate attributes as close as possible to those of a private corporation. In addition, it is imperative that the corporation be free of those administrative and financial controls that constrain the operational efficiency and financial flexibility of a government agency." This should include: moving the corporation outside the appropriations process and Gramm-Rudman-Hollings sequestration control; granting it authority to establish prices for commercial products, materials and services as the new UEE deems appropriate for maximization of profits; and providing it the responsibility for capital financing of improvements, including future spending on development and deployment of AVLIS.

Smith Barney argues that the AVLIS technology can be a significant factor in the new UEE's ability to reduce production costs for enriched uranium and to be competitive in the spot market. However, Smith Barney is concerned that the AVLIS technology may not be deployed in time to achieve its potential and, for this reason, it recommends that AVLIS development, deployment, and licensing be accelerated as much as possible. Smith Barney also recommends that the new UEE bear all further costs it incurs in preparing AVLIS for production.

The report concludes with a response to the question of whether this new UEE, and subsequently the new private UEE, should be directly responsible for the repayment of *sunk costs*. Those sunk costs are defined as "the liabilities for environmental clean-up and ongoing compliance, the costs of decommissioning and decontaminating facilities, and the settlement costs on contracts with the Tennessee Valley Authority." Smith Barney adds, "Efforts to directly recover all or a significant portion of these 'sunk costs' from the UEE's revenues, together with the proposed payback of 'unrecovered government costs' are misdirected and ill-conceived in the context of historical objectives and future business requirements. A requirement to recover these costs would merely serve to create a debt burden and contingent liabilities that will make ongoing enrichment operations infeasible..." The report suggests that the prime method to recover all, or part, of the sunk costs is to develop a competitive, profitable corporation, and then direct the profits received by the government towards reimbursement of those costs.

After a briefing on the report, congressional staffers expressed disappointment that, because the report is considered proprietary information, they are unable to hold hearings to discuss its conclusions. (DOE issued an edited version of the report on June 6.) However, House staffers indicated that the hearing calendar is full for the foreseeable future, and, since the report did not contain any startling new conclusions, there is no pressing need to consider this issue this year. In fact, with much of the summer devoted to clean air legislation, the budget and the appropriations process, it is unlikely a bill will move through the House in 1990, a congressional election year. □

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CANADA

Canada Modifies Nuclear Export Policies

On May 18, 1990, the Canadian Ministry of Energy, Mines and Resources published the results of a Ministerial review, which began last summer, of the commercial aspects of Canada's uranium export policy. The review, part of an effort by the Canadian government to simplify the regulations, led to revisions which will clarify the terms under which Canada exports uranium.

Further-Processing (Upgrading) Requirements

The Ministerial review clarified the export policy by stating, "Canadian uranium destined for use as enriched uranium fuel shall be upgraded to the maximum extent possible in Canada before export, as long as Canada's conversion facilities have the capacity. Exemptions to this requirement will be granted in cases where:

- The uranium will be converted or enriched or consumed in the United States, or
- The Canadian converter is not the successful bidder for conversion services as a result of purely commercial considerations."

The previous policy's wording had been interpreted to allow the exemption of US-bound uranium from Canadian upgrading restrictions only if it were considered US product under the Free-Trade Agreement (FTA). To become US product under the FTA, US services needed to contribute at least 50 percent of the value added. Conversion represents only about five to ten percent of the value of natural UF_6, so the old policy seemed to require conversion *and* enrichment in the USA to gain the exemption.

Pricing Requirements

The pricing policy has been revised to read, "The Canadian government will expect pricing terms in export contracts to provide for an equitable balance of benefits and risks, and to be generally not less favorable than those being obtained in the same time period by competing Canadian and international producers for contracts of similar duration." Moreover, "...each export contract should include mechanisms, such as escalating floor price provisions..." These changes were made to "...help to reduce the impact of unexpected shifts in the market and thereby contribute to a more predictable commercial environment..."

Domestic Security of Supply

Canada's Uranium Exports Review Panel, under the ministers' authorization, will now approve uranium export contracts extending for up to thirty (30) years from the contract execution date as opposed to fifteen (15) years under the previous policy. Also, "It will no longer be required that individual Canadian utilities demonstrate that they have uranium purchase contracts in place to cover their uranium requirements for a specific period of time." Both changes are attributable to the recent estimates that Canadian reserves far exceed the total of domestic requirements plus export commitments. ■

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RECENT DEVELOPMENTS

WASHINGTON FOCUS

May was a busy month in Washington. The House of Representatives passed the Clean Air Amendments Act, DOE released an executive summary of the report by Smith Barney on DOE's uranium enrichment enterprise, and DOE acknowledged it is considering a purchase of Soviet SWU to offset part of its production. In addition, the Nuclear Power Assembly's conference, *Nuclear Energy & The Nineties: The Decade for Progress*, was held at the end of May. A common theme among the speakers was that public acceptance of nuclear power will be the key to any new plant orders.

Clean Air Act

◇ On May 23 the House of Representatives passed the Clean Air Act Amendments bill by a vote of 401 to 21. A joint House and Senate conference committee will meet this summer to negotiate the remaining compromises necessary to pass a law for the President to sign. Many of the outstanding issues affect the utility industry; however, two issues directly affect the nuclear fuel industry. First is a resolution of the dual regulation issue (NRC or EPA) for radionuclides, which is included in the Senate bill, but not in the House version. It should be noted the EPA has not yet completed its rulemaking on radionuclide emission standards, and it is unclear whether the EPA will wait until the legislative process has concluded before proceeding.

The second issue directly affects the three plants, operated by Electric Energy Incorporated (EEInc.) and Ohio Valley Electric Corporation (OVEC), which supply power to DOE's uranium enrichment plants. The plants' emission allowances and their schedule for compliance with the stricter standards of the House bill would significantly increase DOE's costs, and at an earlier date than the Senate bill. The House bill prohibits EEInc. and OVEC from trading any credits they might earn from reducing their plants' emissions; thus, DOE, and therefore its customers, would bear the entire cost of the emissions cleanup.

DOE Uranium Enrichment Funds Reallocation

◇ DOE's request for authorization to reprogram $20 million of the uranium enrichment program's surplus funds for FY90 to unrelated programs (Savannah River reactor startup, advanced reactor design certification, and space research) has stirred controversy in Congress. The American Nuclear Energy Council (ANEC) and the Edison Electric Institute (EEI) jointly wrote a letter objecting to DOE's request to reallocate the funds. They described the request as another example of how DOE's other priorities prevent the enrichment program from being competitive, and as a good reason to enact privatization legislation in order to remove it from government control. Several Congressmen also expressed their opposition. The appropriations committees will consider DOE's request within the next month.

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DOE Purchase of Soviet SWU Possible

◇ Secretary of Energy James D. Watkins confirmed that DOE has discussed with the Soviet Ministry of Atomic Energy & Industry the possibility of purchasing Soviet SWU. Some discussion of US-origin uranium as feed for this contract is also taking place. Such a sale, if made, might carry certain restrictions, such as a cessation of direct sales of Soviet SWU to US utilities. The Soviet Union has also offered to use the foreign currency earned from this DOE sale to purchase goods and services in the USA.

If DOE purchases Soviet SWU to lower its production costs, will it pass this savings on to its customers in lower SWU prices, or will the government keep the savings? That will be one key issue. Another will be finding a mechanism to prevent diverted Soviet SWU from entering the US market. Finally, Congress will insist that DOE can only purchase SWU if the price is lower than DOE's production costs. If DOE must divulge to Congress its actual marginal cost of production, then US utilities, armed with this knowledge, may have new ammunition in their discussions with DOE about termination charges. Secretary Watkins has indicated he would not consider any deal that would jeopardize the department's push for legislation to privatize the program, stating, "If it's a serious political obstacle, I'm not going to do it."

Nuclear Power Assembly Conference

◇ On May 21-23 the Nuclear Power Assembly held a conference entitled *Nuclear Energy & The Nineties: The Decade for Progress*. The most prominent group of speakers assembled at this conference in recent years attracted over 350 people to Washington, DC. Among the speakers were Secretary of Energy James D. Watkins, former Secretary of Energy James R. Schlesinger, a number of administration officials, and several congressmen. The conference focused specifically on advanced reactors; topics ranged from legislative and regulatory initiatives to promote them, to the actual designs and conditions necessary to stimulate orders.

One conclusion to be drawn from the conference was stated succinctly by former Virginia Governor Gerald L. Baliles who believes that, "In the 1990s, improvements in the economics of nuclear energy, combined with growing concerns over the environmental costs of non-nuclear power, could help build greater public acceptance." Many of the speakers indicated that nuclear energy will only be considered as a viable option when the public recognizes the need for it, and when the nuclear waste issue is solved with the construction of a spent fuel repository. Some speakers thought that an actual energy shortage may be necessary before public sentiment will change.

A consensus has formed on the next steps to be taken to create an environment conducive to a new nuclear plant order. First, utilities need standardized designs with inherent safety features that are preapproved by the NRC. Second, there is a need to restore the regulatory compact between

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utilities and public utility commissions to ensure that approval for new plant orders will not be disallowed, and to simplify the current regulatory structure (one speaker referred to it as a byzantine horror show). Third, the USA must solve the practical problems of spent fuel disposal. Finally, the industry must establish better communication practices to alleviate public concerns.

The main obstacle to new nuclear plant orders is the stalled high-level waste repository program. Secretary Watkins and several other speakers mentioned the possibility of recycling some of the uranium and plutonium from spent fuel and burning the long-lived actinides in a new reactor design, the Integral Fast Reactor (IFR), which is under development in Idaho. Although this solution would significantly reduce the volume of waste and also reduce the length of time (from thousands of years to only a few hundred) over which the waste would need to be monitored, it does not obviate the need for a repository.

Radiation Victim Compensation Act

◇ The House of Representatives passed by voice vote the "Radiation Victim Compensation Act" (HR 2372). The bill is designed to compensate uranium miners in Arizona, Utah, New Mexico, and Colorado who were associated with the government's defense programs, and also civilians, known as "downwinders", who lived near the Nevada Test Site. The Senate Judiciary Committee is considering a similar bill, which includes Wyoming's uranium miners. If enacted, the bill will establish a precedent for the federal government to assume responsibility for the consequences of past defense nuclear activities, and could lead to creation of a fund compensating uranium mining companies for mill tailings cleanup. ■

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INDUSTRY BRIEFS

Chernobyl Closure Announced

Coinciding with the fourth anniversary of the Chernobyl-4 accident, five members of the Supreme Soviet made a suprise announcement at a joint news conference in Washington D.C. that the three remaining operational RMBK reactors at the Chernobyl site would be shut down by the end of 1991. New disclosures on the magnitude of severe health effects caused by Chernobyl, as well as safety concerns about the entire plant led to the decision. The Ukrainian government requested the closures, although they will cost the Ukraine region nearly one-tenth of its electrical supply.

♦ ♦ ♦

Pakistan Reopens Baghalchar Uranium Mine

Pakistan's only uranium mine, Balgalchar (located in the Dera Ghazi Khan district of the Punjab province) is being reopened. Early this year, it had been shut down following the deaths of two employees in localized fighting.

Czechoslavakia Delays Temelin-1 and -2

Czechoslovakia announced that completion of the Temelin-1 and -2, 1,000 MWe VVER (Soviet PWRs) nuclear units will be delayed two years to 1994. The Soviet PWR designs will be backfit with Western safety technology. Temelin-3 and -4, which were already under construction, have been cancelled. Czechoslovakia's demand for electricity is expected to rise over the next decade and nuclear power is considered the best solution for added generating capacity. International bids will be sought for the next 1,000-MWe units, on the condition that Czechoslovakian industries supply a major portion of the equipment.

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QML To Sell Stockpile

Queensland Mines Ltd. (QML) has reached an agreement to sell its 6.5 million pound uranium inventory and associated sales contracts to a European intermediary.

Cameco Locates Major Deposit At McArthur River

Cameco announced on May 30 that further drilling at McArthur River P2 North has confirmed expectations of a large, high-grade uranium deposit. Cameco believes that the reserves will exceed 100 million pounds at an average grade of over three percent U_3O_8. Cameco is operator of the McArthur River Joint Venture, which includes Cameco, Uranerz Exploration and Mining Ltd., AGIP Resources Ltd., Interuranium Canada Ltd., Cogema Canada Ltd., and Imperial Metals Corporation. Timing of mine development will depend on the world uranium market and other considerations such as nearby mill capacity.

♦ ♦ ♦

South Africa Likely To Sign NPT

South Africa is expected to sign the nuclear Nonproliferation Treaty (NPT) soon, as indicated by South Africa's closure of its pilot enrichment plant. US officials hope South Africa will formally announce its intention to adhere to the NPT before the NPT review conference in Geneva later this summer.

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RECENT DEVELOPMENTS

EdF Seeks Approval To Build Seven New Plants

EdF plans to build seven 1,400-MWe nuclear power plants, and will begin construction of one a year starting in 1993. Only a year ago, just four new plants were expected to be needed by 2000. Increasing electricity sales, strong economic growth in France, and a number of long-term, electricity export contracts contributed to the change in plans. The Ministry of Industry supports EdF's request, and will seek approval for project funding from the French government.

◆◆◆

New Orleans Public Service Sale Tabled

The city of New Orleans' purchase of the New Orleans Public Service Inc. (NOPSI), originally proposed to shield taxpayers from the cost overuns at Grand Gulf-1, has been tabled by the city council on the basis that the potential savings were not worth the financial risks. The highly publicized deal had already been agreed to following a $10 million, seven-year study that estimated a possible one billion dollar savings to the city.

Operating License Issued For Melox Plant

On May 21, the French government issued an operating license for the Melox mixed-oxide (MOX) fuel fabrication plant. Located at Marcoule, the plant has been under construction since early 1989 and should be completed by early 1994. It will have an annual capacity of 120 metric tons of heavy metal (MTHM), though the license currently limits it to about 100 MTHM/year. The US$250 million Melox plant will process into MOX fuel assemblies much of the plutonium from the La Hague reprocessing plant.

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NRC To Announce Proposed Rule For Extending Plant Licenses for 20 Years

The Nuclear Regulatory Commission (NRC) intends to publish in the *Federal Register* on June 29 a proposed rule allowing plant licenses to be extended for 20 years. A final rule is planned for publication in May 1991. One of the NRC's main problems is whether these plants should be required to comply with safety standards for new plants.

Swiss Nuclear Utilities Plan To Increase Unit Capacities

As a result of public opposition to a sixth nuclear power plant in Switzerland, Swiss utilities are seeking alternative methods for increasing their generating capacity. The utilities are now planning to increase unit capacities by 7% to 15%, adding as much as 200 MWe to the national grid by the middle of this decade. All the modifications can be made without compromising Swiss safety standards, but will require relicensing of the plants. The public will have the opportunity to comment on the proposals for capacity increases.

◆◆◆

Vandellos 1 Permanently Closed

The Spanish government has announced the permanent closure of the Vandellos 1 nuclear unit, shut down last October following a fire. The decision, based on the excessive costs of plant repair and modernization, may adversely affect the future of Spain's nuclear program.

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FINANCING URANIUM EXPLORATION AND DEVELOPMENT PROJECTS IN THE 1990S

The following article is an edited version of a speech presented by NUEXCO's Dustin J. Garrow at the 92nd Annual General Meeting of the Canadian Institute of Mining and Metallurgy in Ottawa, Canada on May 8, 1990.

Introduction

The uranium production industry experienced momentous change during the decade of the 1980s. The Three Mile Island accident took place in the spring of 1979 and, while not necessarily creating the uranium "bust" of the ensuing decade, certainly set the tone for the entire nuclear power industry.

Ever-increasing forecasts of installed commercial nuclear power coupled with a growing concern regarding the adequacy of uranium reserves and production capacity, ignited a wave of exploration and production capacity development in the mid-to-late 1970s which continued into the early 1980s. This momentum lead to over-production of uranium concentrates when compared to the eventual operation of commercial nuclear power plants. This material resulted in expanding inventories held by uranium producers and consumers alike. As these stockpiles inevitably found their way into the spot market, the price (as indicated by the NUEXCO Exchange Value) fell from a peak of $43.40 per pound U_3O_8 in May 1978 to its current level of $8.80 per pound U_3O_8 on April 30, 1990.

As the nuclear power industry enters the 1990s, the debate regarding global warming and the subsequent role of nuclear power generation take on more importance. In any event, the nuclear power programs initiated principally in the 1970s are nearing completion. Even though new orders of power reactors have dropped precipitiously in the 1980s, the generation of electricity by nuclear fission accounts for almost twenty percent of WOCA (World Outside Centrally Planned Economies) electricity production.

In order to place my main topic of financing future uranium exploration projects in perspective, I will review the conclusions of a uranium market study recently completed by NUEXCO Information Services, a group which closely monitors and evaluates the nuclear power industry and the nuclear fuel cycle.

The International Uranium Market

The commercial, non-military uses of natural uranium concentrates consist of fuel for nuclear power reactors. Therefore, the demand for the commodity is a direct function of the level of installed nuclear generating capacity.

At the end of 1989, the total WOCA installed nuclear generating capacity stood at 262,000 MWe (megawatts electric). Under NUEXCO's reference growth case, that total is expected to grow to approximately 336,000 MWe by the year 2000, a compound annual growth rate of approximately 2.1 percent. However, it should be recognized that nuclear power growth will not be evenly distributed. It is anticipated that the USA will experience the lowest annual growth rate (0.7 percent) while the Far East will expand at a much higher rate (5.1 percent per year). Western Europe should increase at 1.7 percent per year, a rate slightly below the WOCA average. These growth rates reflect the relative maturity of the various nuclear power programs and the continuing support for nuclear power among Asian countries.

Uranium requirements from this growth in generating capacity will require a total of 1.6 billion pounds U_3O_8 over the period 1989-2000. This total will, of course, be influenced by a number of factors such as the capacity factor of the reactors themselves, as well as various factors unique to the nuclear fuel cycle. By the year 2000, Western Europe will be the most significant consumer of uranium, representing more than 40 percent of the total; while the United States will require almost 30 percent of the aggregate WOCA need. Utilities in the Far East will consume about 23 percent of the total.

Although the aggregate annual uranium requirement is of substantial importance, the amount of uranium yet to be contracted for is the crucial element for uranium exploration and the development of new production facilities. Historically, utilities with massive investments

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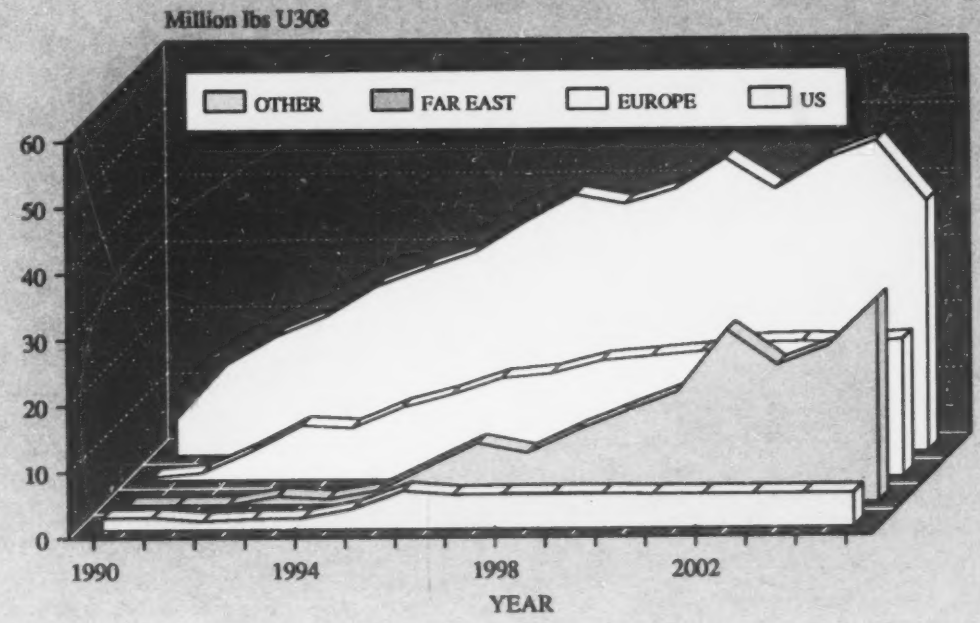
Figure 1
UNFILLED URANIUM REQUIREMENTS BY REGION



in nuclear power stations have relied upon long-term uranium supply agreements to provide the degree of reliability determined to be necessary to ensure uninterrupted plant operations. Although this strategy has undergone some changes in recent years, according to NUEXCO's extensive data base of uranium contracts, WOCA utilities had committed to purchase fully 60 percent of the forecast uranium requirements through the year 2005. However, once again, that coverage was unevenly spread throughout the various consuming countries. While European countries' existing long-term purchase agreements could provide more than 75 percent of anticipated uranium needs and Far Eastern utilities have as much as 65 percent of requirements already committed, the US nuclear utilities have only covered one-third of their requirements over the next decade and a half.

Based upon this assessment, unfilled WOCA uranium requirements over the period 1989-2005 total just under one billion pounds U_3O_8. American utilities will need to procure almost 500 million pounds U_3O_8 in order to satisfy reactor feed requirements during that time frame (**Figure 1**). NUEXCO has conducted a detailed evaluation of each specific uranium production facility in the Western World. Such factors as reserve base, ore grades, extraction technology, future delivery commitments, and production costs are assessed and a judgement made as to the future role of that specific facility in the 1990s and beyond. Those collective judgements are then aggregated to develop the uranium production forecast. This forecast includes the emergence of the COMECON countries (principally China and the Soviet Union) as long-term sources of nuclear fuel for the Western utilities.

While China's future role appears to be defined by existing long-term delivery commitments to European and US utilities, the Soviet Union has begun to expand its marketing activities beyond supplying uranium enrichment services to Western Europe. It is NUEXCO's opinion that the Soviet Union can possibly supply as much as eight million pounds U_3O_8 per year to the West by the mid-1990s, compared to only three million pounds total contributed by all COMECON countries in 1989.

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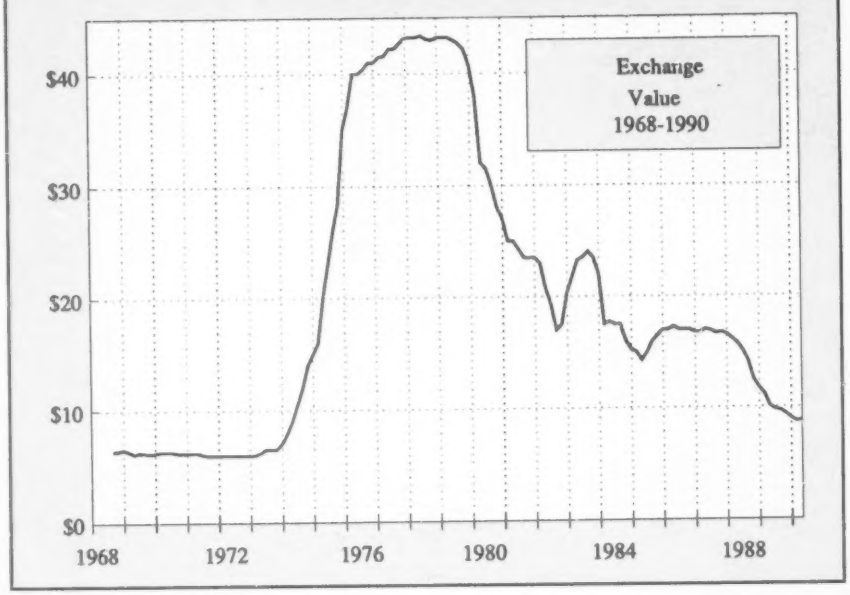
Taking into account uranium exports from China and the Soviet Union during the 1990s, NUEXCO anticipates that worldwide uranium production will still decline to 88 million pounds U_3O_8 in 1990 and continue that downward trend through 1992 when the total will fall to 84.7 million pounds U_3O_8. Total uranium production will then commence a trend of gradual annual increases through the year 1999 when aggregate production will reach slightly more than 120 million pounds.

Figure 2
NUEXCO EXCHANGE VALUE
1968-1990



Uranium Price Trends

No discussion of a mineral commodity would be complete without some indication of price trends. NUEXCO's monthly uranium market price indicator, the NUEXCO Exchange Value, was first published in August 1968 at a level of $6.35 per pound U_3O_8. It has since risen to a zenith of $43.40 per pound U_3O_8 in May 1978, and then declined to a record low, in constant dollars, of $8.70 per Pound U_3O_8 on February 28, 1990. It was most recently reported at $8.80 per pound U_3O_8 on April 30, 1990 (**Figure 2**).

Now, what about future uranium prices? Well, NUEXCO's current price forecast is considered proprietary and available only to subscribers to the Annual Uranium Market Study. However, I can state that uranium producers may expect improved contracting conditions over the next several years. This is not to say that "happy days" will be here again, but, market conditions should become more encouraging for the uranium production sector, with prices sufficient enough to encourage new development.

Uranium Exploration Activities

The International Atomic Energy Agency's (IAEA), biennial report entitled, "Uranium—Resources, Production and Demand," compiles worldwide uranium exploration statistics. For those countries reporting, as of the end of 1986, uranium exploration expenditures declined from more than US$537 million in 1981 to $150.3 million during 1986, a 72 percent drop. The most significant decline occurred in the USA where 1981 expenditures totaled $180.3 million but plummeted to $25.1 million a mere five years later.

In its assessment of uranium exploration, the IAEA makes the observation that:

> "Although the current level of exploration may not be an immediate cause for concern, as known resources and inventories are adequate to provide the required uranium supplies for several years, it may not be sufficient to secure the resources needed for the longer term, which have to be located before long if they are to be developed in time for use at the beginning of the next century."

It is worthy of note that uranium exploration expenditures during 1985-1986 represented less than 15 percent of WOCA's peak expenditures of 1979-1980.

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Turning now to Canada specifically, market conditions have clearly resulted in a severe reduction of Canadian uranium exploration as well. Virtually all activity is being carried out in the Athabasca Basin of Saskatchewan and the Northwest Territories. Uranium exploration expenditures peaked in 1980 when more than 503 kilometers were drilled. During the period 1984-1986, exploration activities remained relatively stable and experienced a slight upturn in 1988. Corporate expenditures on advanced exploration programs at the Cigar Lake and Midwest Projects were major contributors to this gain. According to Energy, Mines and Resources Canada, the ten most active operators accounted for 98 percent of total expenditures.

Uranium Development Projects

As you will recall, NUEXCO's latest projection of uranium production indicates that uranium output will need to increase beginning in the mid-1990s. An examination of the specific production centers reveals that during the 1990s, NUEXCO anticipates that approximately 20 new uranium production facilities may be developed in order to satisfy growing uranium demand. These projects represent an annual production capacity of 42.6 million pounds U_3O_8.

Utilizing general "rules-of-thumb" for newly-constructed uranium production projects, the total capital required to put this capacity in-place could approach $1.0 billion. That assumes that each conventional production center constructs its own processing plant, which might not be the case (particularly in Saskatchewan), but, in any event, the infusion of capital into the uranium industry could be relatively significant.

According to NUEXCO's projection of new production facilities, more than 70 percent of that added capacity is expected to take place in North America. Western Canada is anticipated to be the leader in uranium project development with five projects representing annual production capability exceeding 24.0 million pounds U_3O_8 (almost 57 percent of the additions) (**Table 1**).

To describe current conditions in the US uranium production industry as dismal would probably be too generous. According to data gathered by the U.S.

Table 1
POSSIBLE FUTURE URANIUM PRODUCTION CENTERS
(Western Canada)

Project	Ownership	Annual Capacity (Thousand Pounds U_3O_8)
SASKATCHEWAN		
Cigar Lake	Cameco Cogema (France) Idemitsu Kosan (Japan) Korea Electric Power	12,000
Midwest	Denison Bow Valley Uranerz (West Germany) PNC (Japan)	3,600
McClean Lake	Minatco Occidential Inco	2,000
Dawn Lake	Cameco Cogema PNC CEGB (U.K.) Korea Electric Power	3,000
NORTHWEST TERRITORIES		
Kiggavik	Urangesellschaft Canada (W. Germany) CEGB Daewoo (Korea)	3,500
	TOTAL	**24,100**

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Department of Energy's (USDOE) Energy Information Administration (EIA), in 1977, a total of 146 firms conducted uranium exploration, 135 companies were involved in uranium mining, and 26 firms operated uranium milling facilities. By 1988, 26 companies were active in uranium exploration, 15 companies mined uranium, and only three mills were operating.

Perhaps of more importance to future development is the fact that the US uranium supply industry suffered cumulative net financial losses amounting to $940 million during 1982-1988. Moreover, the net book value of assets classified as property, plant and equipment declined by 84 percent from its 1982 level of $2.1 billion down to $338 million seven years later. These dire financial results have taken place even in the face of concerted attempts to restructure the industry to enhance its profitability.

The EIA, in its conclusions to the assessment of the financial capability of the US uranium industry, makes the following observation:

> "Investment activity is usually spurred by considerations of current or future profitability, by capacity constraints, or by projected changes in future demand. None of these elements, singly or collectively, augurs well for a significant inflow of investment funds into the domestic uranium mining and milling industry in the foreseeable future."

Recent papers and presentations by industry participants and analysts on the subject of financing uranium developments reach similar conclusions: The absence of long-term uranium sales agreements containing prices which provide some foundation for taking a new uranium project into development, as well as the present high inventory levels and low spot prices, severely hinder the likelihood of new exploration and development, though it is most definitely necessitated.

Successful Development Financing Examples

Prior to examining future financing options for uranium developments, it might be instructive to briefly look at some of the financing strategies utilized in the past. The USDOE/EIA in its assessment of the "viability" of the US uranium mining and milling industry discovered that, during the period 1982-1988, a "significant percentage of total funds were initially generated by the industry from its continuing operations (i.e., net income, depletion, depreciation, amortization, deferred taxes and other funds)." Obviously, it may be preferable to fund uranium exploration and development from the financial results of previous development. Moreover, the restructuring which has taken place in the USA as reflected by the decline in asset values, "implies the use (loss) of equity to finance the continued existence of the industry."

Let's now look at several examples of financing techniques used during the past decade for uranium developments.

- The Ranger Mine (Northern Territories, Australia) was financed through advances from a group of Japanese utilities (A$140 million) as well as a syndicated loan program (A$250 million). The project had placed a significant portion of anticipated production under long-term contracts with floor prices greater than US$30 per pound.
- Uranerz Exploration & Mining financed its one-third interest in the Key Lake Project development utilizing a loan (C$120 million) provided by the Bank of Montreal, Toronto Dominion Bank, and Barclays Bank. Once again, UEM had acquired long-term uranium sales agreements with minimum price provisions. Moreover, the banks required completion guarantees from UEM's parent company.
- The massive Olympic Dam Project received its development financing via the participation of British Petroleum, a minority participant in the project. One stipulation of the participation agreement was that BP would contribute funds necessary to conduct the evaluation as well as provide the requisite project financing.
- Gulf Mineral Resources expended more than US$400 million on the initial assessment and development of the huge Mt. Taylor Project (New Mexico). It is NUEXCO's understanding that these funds were provided by the parent company.
- On a somewhat smaller scale, Uranium Resources, Inc. funded the development of its Kingsville Dome Project (South Texas) through a complex loan arrangement with Elders Finance, Inc., a US subsidiary of Elders IXL of Australia. This credit facility was initially established at US$20.3 million and incorporated stock warrants and other considerations. Recently, URI completed a public offering of units

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(common stock plus warrants) totaling $4.5 million. The proceeds from this offering are intended to be utilized to fund the development of the Rosita Project (South Texas).

◆ The Highland Uranium Project (Wyoming) received initial funding from a private share placement. The proceeds from this sale were applied to property acquisition, permitting and engineering/design. The project developer, Everest Minerals Corporation, then sold a minority share of the project to a West German mining company, Interuran, in a transaction which generated sufficient capital to fund project construction. Once again, the project's baseload production was already under contract at prices well above the spot market.

Due Diligence

The financing of future uranium production facilities will depend upon, to a great extent, the outcome of the process commonly referred to as "due diligence." This is a truism no matter if the project sponsors approach a financial institution (e.g. commercial bank), sources of equity capital (e.g. private placements, public offerings), or potential joint venture partners. In all cases, the project proponent will have to satisfy the source of capital that the project represents a combined risk profile which is acceptable to that source.

Traditionally, the due diligence process examines a broad spectrum of issues relating to the proposed project. These issues include reserve base, ore grades, proposed extraction/processing technology, governmental/regulatory environment, status of permits/licenses, engineering evaluation, projected production cost structure, managerial/professional staff, experience of the personnel involved, anticipated market conditions, and the level of projected production committed under multi-year sales agreements with minimum price protection.

Each type of funding source will assess each factor and weigh the risks involved. Clearly, there are ways to "lay-off" risk which the financial source deems excessive or unacceptable. Corporate/personal guarantees and the pledging of project/corporate assets (including sales agreements) are only two of these approaches. Some may conclude that most, if not all, proposed uranium production facilities would fail to pass this due diligence review process. Perhaps, this is correct. However, I think not.

Table 2
URANIUM PROJECT PHASE/FINANCING ALTERNATIVES MATRIX

	Grassroots Exploration	Advanced Exploration	Reserve Delineation	Project Development	Construction
Risk Capital	X	X	X	X	X
Internal Financing	X	X	X	X	X
Public Offering (debt/equity)	X	X	X	X	X
U_3O_8 Loans/Sales			X	X	X
Sales Agreement "factoring"				X	X
Bank Financing				X	X
Joint Venture	X	X	X	X	X
Advance Sales of Product				X	X
Trading	X	X	X	X	X

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Future Financing Alternatives

In his presentation before the Uranium Institute's Supply and Demand Committee (September 5, 1989), my NUEXCO colleague, Mr. Don Nichols, discussed a variety of financing options which might be available to develop new uranium projects. A summary table contained in that paper provides an "alternatives matrix" for financing approaches (reproduced as **Table 2**).

As you will see, a number of financing alternatives are deemed appropriate for project development. Once again, however, the due diligence process may limit the application of some financing techniques, particularly in the short-run.

As can be seen on the alternatives matrix, funding options for grassroots exploration are limited and really can come from risk capital, internal financing and joint ventures. The latter approach has become increasingly prevalent as an approach to spreading the exploration risk among several parties. However, internal financing remains a popular technique.

As a proposed project reaches the development stage, increasing options are presented due to the, hopefully, decreased associated risk. By this stage in the project evolution, engineering/design work has been completed, the requisite permits/licenses received, pilot plant operations conducted to support the earlier forecasts of production costs and technology applicability, and sufficient sales commitments secured to mitigate excessive market risk, especially in the early years of commercial operations. What are some of these financing approaches?

- The **joint venture** has been extensively utilized in uranium projects, many of which were devised under tax provisions, especially in the USA. This structure allows the participants to fund a share of the joint-venture on a percentage basis which differs from the actual ownership share.
- **Traditional bank financing** (usually in the form of a project term loan) has been effectively utilized in the past. Major factors examined in the due diligence process might include proven reserve base, proven mining technology, proven operational capability (difficult to demonstrate for a first-time producer), a "responsible" entity requesting the loan, and a firm sales contract with a financially sound customer (sales commitment should ensure net cash flow of 150-200% of the principal and interest payable during the loan term).
- **Uranium loans** can provide a vehicle for project financing. The would-be producer borrows uranium which is then sold in order to generate the capital necessary to finance project development. The loan can then be repaid from future production plus accrued interest (sometimes payable in-kind).
- Another strategy which might apply involves **advanced sale of product** or, more likely, the *factoring* of existing long-term uranium sales agreements. Generally, these agreements must incorporate "predictable" pricing either in the form of a base price subject to escalation or a firm floor price if the agreement contains spot market-type pricing. These two approaches have been used in the not too distant past, but have been increasingly difficult to pursue as the spot market has deteriorated.
- **Government investment** and/or debt underwriting provided the financing for a number of past uranium developments. Perhaps the most recent example of this concept was the establishment of Saskatchewan Mining Development Corporation in 1974 (subsequently merged in 1988 with Eldorado Nuclear Limited to create Cameco, A Canadian Mining and Energy Corporation). The Province of Saskatchewan advanced equity funds for uranium exploration and development as well as underwrote long-term debt offerings. Although this activity might not be considered a subsidy for the company, the financial backing certainly helped SMDC's uranium activities progress.

Cameco

Before closing, I would like to make a couple of observations regarding the crucial role that Canada is expected to play in the future of the uranium production industry. As stated previously, more than 70 percent of anticipated new uranium production capacity is expected in North America and the majority of those additions will take place in Western Canada. Cameco will play a significant part in that future growth since it controls more than 400 million pounds of low-cost uranium reserves in the Athabasca Basin. Cameco produced more than 13.5

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million pounds U_3O_8 in 1989 for its own account, representing 15 percent of WOCA uranium production.

While the current ownership of Cameco is vested in the Province of Saskatchewan (61.5 percent) and the federal government of Canada (38.5 percent), the merger agreement called for the two governmental entities to reduce their shareholdings by 30 percent within two years, 60 percent within four years, and 100 percent within seven years. Unfortunately, market conditions have not been conducive for that schedule. Upon its formation, Cameco negotiated a loan agreement totaling C$650 million with a consortium of eleven banks. The proceeds from this loan package were utilized to repay promissory notes issued by Cameco at the time of the merger.

In an effort to lessen its debt load, Cameco announced on April 2, 1990, that agreement had been reached to sell a one-third interest in the Rabbit Lake uranium mining operation to Uranerz Exploration and Mining Limited, a wholly-owned subsidiary of Uranerzbergbau-GmbH (Bonn, Germany). The sale price was C$160 million, which is to be used to retire debt.

Conclusion

The current uranium market remains one of excessive inventories and depressed price levels. The financing of uranium exploration and development is problematic when the due diligence process is applied. However, company ownership and individual properties continue to change hands as firms assess the future of the industry.

Assuming that price levels begin to show some improvement and in the face of increasing demand for the product, I am of the opinion that sufficient financial resources will be available to the industry, perhaps from a variety of sources. Those companies which have positioned themselves with low-cost reserves should be able to proceed with planned projects on a schedule closely tailored to the marketplace. ■

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ELECTRICITÉ DE FRANCE

Electricité de France (EdF), under the leadership of Pierre Delaporte, has become one of the most progressive organizations in the nuclear power industry. In recent years, EdF has adopted a newly aggressive, innovative attitude toward international market opportunities.

With 52 operating units (net capacity 51,000 MWe), France's national utility is the world's largest nuclear generator. It is fast becoming the battery of Western Europe, having exported 42,000 GWh in 1989 alone, a figure that could double by 1995 as power demand grows throughout Europe. Furthermore, by using its substantial operating experience, EdF has successfully taken over the French drive to export power plants worldwide. In the nuclear fuel market, the utility has expanded its activities beyond purchasing, assumed greater control over its fuel cycle, and sought innovative ways to manage its inventories.

Electricity Source for Europe

At 75-percent nuclear, EdF has the highest percentage nuclear generation of any major electric utility in the world and the largest installed capacity. **Table 1** illustrates the evolution of EdF's production mix since 1970. Hydro and coal-generated power dominated French production until the late 1970s, when the first of 34 standardized 900-MWe PWRs came on line. The country's nuclear power program expanded dramatically during the 1980s, as capacity increased fivefold (**Figure 1**). Eight large PWRs are nearing completion at present and will add another 10,800 MWe of capacity by 1993.

The rapid growth of nuclear capacity has outstripped French electricity demand, and many of EdF's plants have been underutilized in recent years. The average capacity factor at French nuclear plants in 1989 was 64 percent. However, EdF's prospects for exploiting the overcapacity have improved due to the following developments.

◆ ***Growth of French Industrial Demand*** — Under the direction of Mrs. Colette Lewiner, Director of Business Development and Commercial Strategy, EdF has aggressively marketed power to major industrial consumers in an effort to baseload demand for the 1990s. One of the first and biggest incentive power contracts was concluded with Pechiney, the giant aluminum producer; other contracts have been signed with users in diverse industrial sectors. Several foreign companies, Exxon for example, have established or enlarged their businesses in France, apparently lured by the attractive electricity rates. EdF's president, P. Delaporte, has referred to such contracts with foreign companies as "domestic exports" (see sidebar on page 31).

◆ ***Demand for Power in Neighboring Countries*** — Several of France's neighbors have been eager buyers of EdF's electricity, notably Italy and the UK, whose own nuclear power programs have been curtailed. Since the 2,000-MWe Cross-Channel link between France and the UK entered service in 1986, the UK has become EdF's leading export customer (**Table 2**). Spain, which recently made the decision to close Vandellos 1 (480-MWe GCR) despite rapidly growing power demand, could become another big buyer of French electricity. Portugal recently agreed to buy approximately 300 MWe per year from EdF via a Spanish utility.

◆ ***Opening of Eastern Europe*** The opening of Eastern Europe, where power shortages and smog pose urgent problems, is already providing direct opportunities for EdF in countries such as Hungary. Other opportunities are expected following the reunification of Germany. West German utilities

Table 1
EdF PRODUCTION CAPACITY (MWe)

	1970	1973	1976	1979	1982	1985	1988	1989
Nuclear	1.4	2.4	2.3	7.5	22.7	36.9	50.8	50.9
Thermal	13.5	17.1	20.5	22.0	22.1	20.1	16.9	16.2
Hydro	14.2	15.0	17.0	17.9	19.8	20.5	22.7	22.7
Total	**29.1**	**34.5**	**39.8**	**47.4**	**64.6**	**77.5**	**90.4**	**89.8**

Source: Electricité de France

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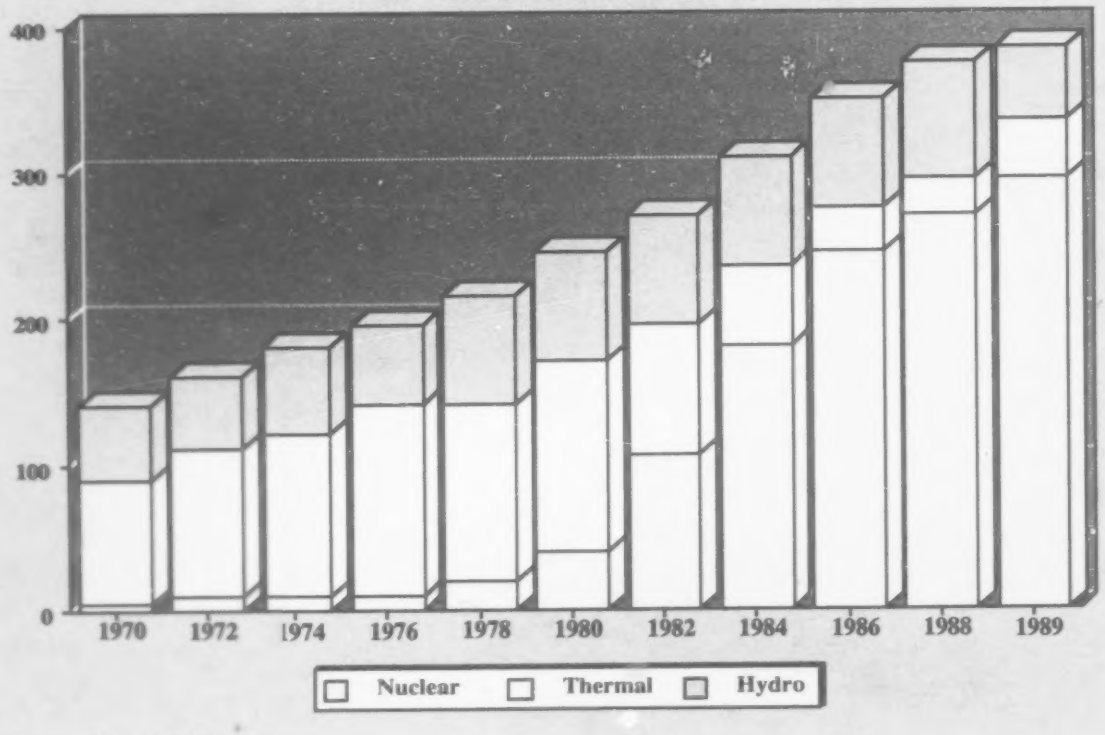
are likely to take over the East German market and closely influence the markets of nearby countries such as Poland and Czechoslovakia. Such an eastward shift will open new opportunities for EdF in West Germany, aided by the liberalization of the European Community market after 1992. Currently West Germany is not a major buyer of French electricity, mainly because coal-fired power is heavily subsidized in West Germany.

According to M. Delaporte, the main obstacle to the expansion of EdF's export sales will be the limited capacity of existing transmission lines. Environmentalists oppose erection of new high-voltage lines across the Alps, limiting EdF's direct access to Southern European markets. A new link across the English Channel would be more costly than the first, due to a much wider crossing. Access to Eastern European markets is dependent on construction of a modern power system in those countries, as well as power lines to reach them. Overcoming these obstacles presents a formidable challenge to European leaders, but with the accelerating trend of European integration, the obstacles are not insurmountable. In any case, improvement of the European grid is probably more likely than construction of new nuclear capacity elsewhere in Europe.

Power Plant Expertise

In recent years EdF has successfully marketed its expertise in nuclear plant design and engineering, and has collaborated with Framatome, the French reactor vendor, to sell French power plants abroad. The state utility owns ten percent of Framatome; other owners are CGE (Compagnie Générale d'Electricité), a publicly traded company that recently gained a majority share in the vendor, and France's CEA (Commissariat à l'Energie Atomique). In an export market with few real opportunities, EdF has helped position the French nuclear industry for plant sales at Daya Bay in China, and

Figure 1
EdF ELECTRICITY PRODUCTION



Source: Electricité de France

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The following excerpts are taken from an interview with Pierre Delaporte, president of EdF, published in the French magazine, Le Nouvel Economiste, of April 20, 1990. The text is an unofficial translation from the French original.

On the possibility of additional plant orders in France:

"The only thing certain is the order for Civaux Unit 1. Aside from that, nothing has changed...although it is true that we at EdF are asking ourselves if we won't need to build a new unit every year, instead of one every two years as we thought a short while ago."

On electricity sales to industrial users in France:

"The deal with Pechiney was complemented by several smaller deals with companies in petrochemicals, chemicals, metallurgy, paper, etc. Our best exports have been domestic exports; i.e., sales to foreign companies operating within France. Factories have been built in France which, without our attractive power deals, would have gone elsewhere..."

On the growth of electricity exports:

"I think exports will grow, but they will also run up against an obstacle, which is the limited capacity of existing transmission lines and the difficulty in building new lines...For the UK, we need a second cross-channel link, but the structure of the British grid would force us to build the link far west of the first, with much longer sea length. The cost is estimated at one billion pounds sterling! With Italy, could we build a new line in reasonable time between the Rhone and the Po valleys, when we know how active the environmental opposition is on both sides of the Alps? The brakes on exports are no longer political...Today our biggest problems are environmental."

On electricity exports to Germany:

"We have been stopped, until recently, by the famous 'century contract' that forces German utilities to buy a large portion of German coal...Today we see the situation improving because of German reunification...[The East German production system] is worse than we thought, very old, inefficient, and ecologically disastrous...It will be better to burn West German coal in East Germany than to badly burn the lignite of the East. Suddenly the 'Siegfried Line' of electricity should go away like the Iron Curtain, and our power sales to Germany, until now rather weak, could rise to the level of our sales to the UK and Italy."

On power plants in Hungary:

"The Hungarians can go with us from hell to paradise. Switzerland enjoys an electricity paradise; strong national production, strong neighboring grid systems, therefore complete security...Hungary is comparable to Switzerland from the geographical point of view, but its electricity situation is the opposite... Hungary depends for 30 percent of its power supplies on the Soviet Union, a single faraway supplier. This is why EdF is studying the idea of building, through a joint venture or in another way, two 900-MWe units at Paks. The feasibility study will be completed at the end of this summer...The project would have major geopolitical significance, because there would no longer be just a few transmission lines, but a majestic bridge between East and West..."

On cooperation with Framatome for plant exports:

"We disagree [EdF and Framatome] about the idea of supplying power stations 'turnkey.' In the nuclear industry, we cannot, as is done in other industries, leave the site three months after the start of operation and forget about the plant...We have to have a long-term presence... Framatome can do that, maybe, but it is not a utility. The Chinese technicians for the Daya Bay plant are trained at Gravelines, and similarly, the Hungarians will not learn in the Framatome factories, but in EdF's plants."

On a nuclear power revival in the USA:

"Admiral Watkins [US Energy Secretary] talks seriously about a nuclear power revival in the USA after 1995. That could encourage others...However, we should not say that the Americans were right to stop their nuclear program in 1975 and are now right to restart it because the 'new nuclear' is better than the old, with all the business about 'inherent safety' and 'passive security'."

On cooperation with Germany:

"EdF feels that if we want to have a good nuclear industry in Europe, we have to ally ourselves with the Germans..."

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Table 2
FRENCH ELECTRICITY IMPORT/EXPORT NET BALANCE[1]
1987-1989 (TWh)

	1987			1988			1989		
	Shared[2]	Other[3]	Total	Shared[2]	Other[3]	Total	Shared[2]	Other[3]	Total
Belgium/The Netherlands	- 1.4	2.9	1.5	- 0.8	3.9	3.1	- 1.3	4.9	3.6
Italy	0.3	4.8	5.1	0	9.6	9.6	0.6	10.8	11.4
Monaco	0	0.2	0.2	0	0.3	0.3	0	0.3	0.3
Spain/Portugal	- 0.8	2.3	1.5	- 0.8	2.0	1.2	- 0.6	0.1	- 0.5
Switzerland	3.2	3.8	7.0	3.7	3.3	7.0	4.0	8.7	12.7
United Kingdom	0	12.0	12.0	0	13.0	13.0	0	13.0	13.0
West Germany	2.6	0	2.6	2.7	0	2.7	2.3	- 0.6	1.7
Total	**3.9**	**26.0**	**29.9**	**4.8**	**32.1**	**36.9**	**5.0**	**37.2**	**42.2**

[1] *Source*: EdF

[2] Balance from cross-participation in power plants. (For example, France had a net import from Belgium and The Netherlands because of EdF's part ownership in Belgium's Tihange plant.)

[3] Other means straight sales, purchases, or exchanges of electricity.

potentially in Hungary. China and Hungary are two of the few countries that are serious about building new nuclear plants at this time.

The Daya Bay project is modeled on EdF's Gravelines station in Northern France, where Chinese technicians also receive their training. The Hungarian contracts, signed in December 1989, initially involved engineering and consulting services for upgrading of the Paks station, but have evolved into a draft project for construction of two 900-MWe PWRs at the same site. The current plan is to dedicate one unit for Hungarian domestic consumption and one unit for electricity exports, mainly to Austria and Italy—two countries with nuclear moratoriums and substantial power needs. The power sales abroad would facilitate project financing.

EdF and Atomenergoexport (AEE), the Soviet Union's nuclear power plant export firm, signed a contract in December 1989 for France to provide plant expertise to the Soviets. Under the contract, EdF will install computer hardware and software for AEE for use in design work and will train the Soviet personnel in French facilities. The contract was signed by the utility's wholly-owned subsidiary, EdF International.

EdF has an active technical group working on the next generation of nuclear reactors, to succeed the current generation of 1,300-MWe and 1,450-MWe PWRs. However, unlike research efforts in the USA, the French project, called "PWR 2000," is focused on improvements to the existing PWR design rather than fundamentally new reactor designs. EdF has never doubted the soundness of PWR technology. Although environmental pressure on the French utility has grown in recent years, both from the public and the government, it has not suffered criticism of its nuclear program to the degree that utilities in the USA and West Germany have been subjected.

Natural Uranium Activities

The recent announcement that EdF had entered negotiations to acquire Malapai Resources, a US uranium producer, signaled a change in the utility's approach to nuclear fuel procurement. EdF is clearly becoming more active and independent in the nuclear fuel market than in the past—just as it has become more active in nuclear plant construction and services. In plant exports, EdF has assumed a role traditionally held by Framatome. In uranium supply, it has entered the domain of Cogema (la Compagnie Générale des Matières Nucléaires), the CEA arm responsible for the nuclear fuel cycle.

Historically, Cogema has supplied as much as 75 percent of the uranium EdF has purchased annually, while TOTAL,

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Figure 2
FRANCE
NUCLEAR POWER UNITS AND FUEL CYCLE FACILITIES

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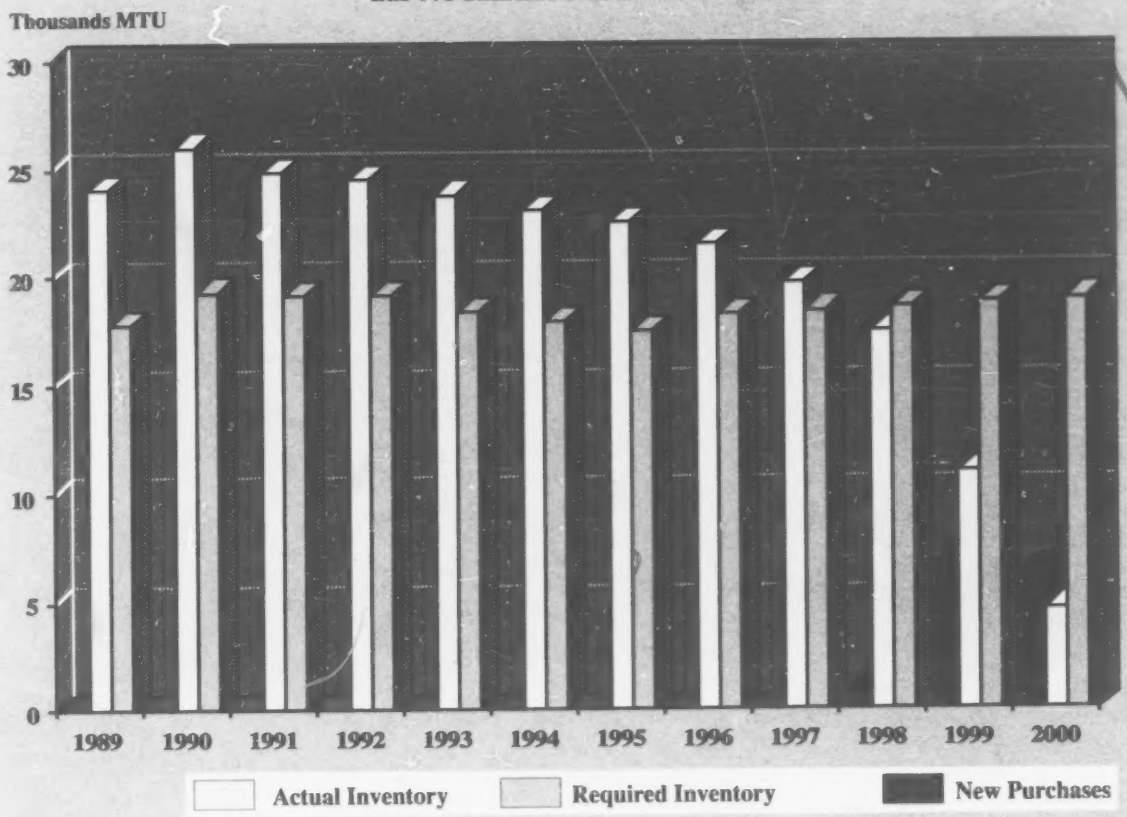
Figure 3
EdF NUCLEAR FUEL INVENTORIES[1]



[1] Based on average expected requirements and existing supply arrangements as of August 1989.

Source: *The Nuclear Fuel Procurement Strategy of Electricité de France* by Yves Thomas, USCEA Conference, September 1989

the diversified French oil company, has supplied about 15 percent. Much of the uranium delivered by French suppliers has been produced from high-cost projects associated with French political interests. Some eight million pounds equivalent U_3O_8 per year comes from domestic production, subsidized for national security reasons. A similar quantity comes from Gabon and Niger, two underdeveloped African countries with close political ties to France dating from the colonial era. The other principal sources are Cogema's Canadian mining project at Cluff Lake, Saskatchewan, and TOTAL's interest in Rössing Uranium Limited, Namibia.

Cogema's two uranium supply contracts with EdF will continue for several more years, but despite increases in its installed generating capacity, EdF is not preparing to expand those arrangements. During the 1980s, EdF concluded a number of long-term contracts with suppliers outside France, as well as a handful of spot contracts to supplement its French contracts by about two million pounds equivalent U_3O_8 per year. Among those agreements were one with Queensland Mines Limited of Australia signed in 1981 and recently completed; one with ENU (Empresa Nacional de Uranio) of Portugal, signed in 1985 and nearing completion; one with CNEIC (China

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Nuclear Energy Industry Corporation), signed in 1985 and continuing into the 1990s; one with ERA (Energy Resources of Australia) signed in 1988 and also extending into the 1990s; and one with Malapai, signed in 1986 and continuing for several more years.

EdF's decision to acquire Malapai, a surprise move in a market that in recent years has seen little utility involvement in mining projects, could be viewed as an innovative strategy for inventory management, as well as an interest in long-term security of supply. Malapai's assets, in addition to its Wyoming uranium properties, include a handful of relatively high-priced contracts, among them, the one with EdF, one with Synatom of Belgium, and some in Japan. As the owner of Malapai, EdF could cancel deliveries to its own account and, in theory, service the Malapai contracts from existing supplies rather than costly new production. EdF's accumulated natural uranium inventory is estimated to amount to slightly less than four years forward requirements, a level that will decrease only slowly due to ongoing supplies received and technical fuel changes (**Figure 3**). The utility's minimum inventory requirement is three years' forward requirements, including concentrates, UF_6, enriched materials, and fuel assemblies.

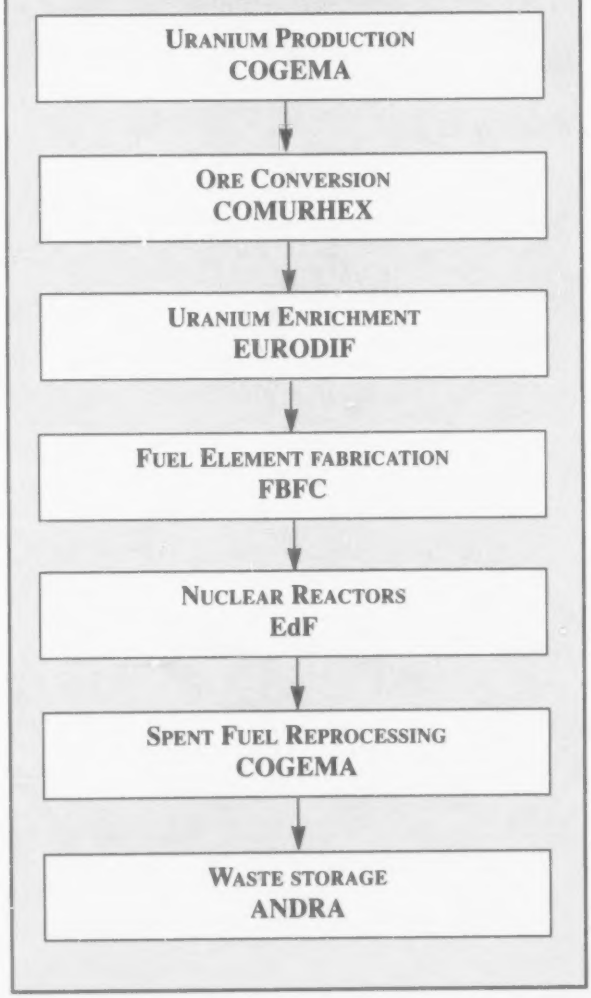
The EdF–Malapai transaction is due to close on June 15, 1990, provided all technical conditions are met. The price has not been disclosed, although it is rumored to be in the broad range of US$50 to $60 million. EdF has created a US subsidiary, FITCO (Fuel International Trading Corporation), to handle its US uranium activities. TOTAL's US subsidiary, which has solution mining interests in Texas, would be employed as the operator of Malapai's uranium production business.

Fuel Cycle Activities

EdF's keen interest in fuel supply diversity and optimization may be motivated in part by its struggle to achieve a profitable balance sheet. In 1989 the utility lost approximately four billion French Francs on sales of FF146.7 billion. The 1989 loss was attributed mainly to warm weather conditions, which resulted in low hydro output, low cooling water levels at some nuclear stations, and increased coal and oil purchases. Other reasons for the loss included a government delay in implementation of rate increases, and technical problems at some nuclear plants.

Whatever the motivation, EdF is actively working to reduce its fuel cycle costs, potentially at the expense of its traditional French suppliers (**Figure 4**)—Cogema, Comurhex, Eurodif, and FBFC (Société Franco–Belge de Fabrication de Combustibles), all of whom depend on EdF for well over half their business. While the utility is unlikely soon to curtail its business with those suppliers, it may look elsewhere to cover new requirements.

Figure 4
PRINCIPAL COMPANIES OF THE FRENCH FUEL CYCLE



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Until now, EdF's only known conversion contract outside Comurhex has been held via Cogema, for Canadian concentrates at Cameco. However, the utility has not ruled out consideration of other lower-cost suppliers.

Similarly, EdF's relationship with Eurodif is evolving. The utility formally holds its enrichment contracts with Cogema, a 51-percent owner of Eurodif, but EdF no longer consults via Cogema for all arrangements with Eurodif. EdF directly negotiated a new arrangement with Eurodif for the early 1990s, under which it deferred substantial SWU deliveries and essentially brought its enrichment supplies into balance for the near term. Until now, the utility's only other known enrichment sources have been taken via Cogema, from both the US DOE and Techsnabexport, under long-term contracts entered into in the 1970s.

At the moment, EdF is bound by contract to reprocess some 8,000 MTU of irradiated fuel with Cogema. France's investment in reprocessing has been reaffirmed in recent years, and construction is underway on expanded reprocessing facilities at La Hague, reprocessed uranium reconversion facilities, and mixed-oxide (MOX) fuel fabrication facilities. The utility has thus far supported these investments and begun a program to introduce MOX assemblies in the 900-MWe PWR series. A strategy for use of recovered uranium feed has not yet been defined; the decision in that regard is thought to rest on negotiations with enrichment suppliers, as well as with progress in the economic development of laser enrichment. In a paper presented in September 1989, Mr. Yves Thomas, head of EdF's Uranium-Enrichment Branch, noted that a decision on the use of recovered uranium should be made during 1990.

While EdF may have given no evidence yet of a shift toward new suppliers of fuel cycle services, nor of a decision to reconsider the economics of reprocessing, it has shown a clear interest in the secondary market as a vehicle to lower inventory carrying costs. Transactions such as loans, exchanges, and sale/buybacks have received considerable attention as a means of earning income and reducing costs. Such openness to new business reflects EdF's current spirit of enterprise. ■

Jim Lightner

Figure 5. The Gravelines nuclear power station in Northern France, containing six 910-MWe net PWRs.

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NUCLEAR INDUSTRY CALENDAR

1990	
June 10-15	***American Nuclear Society Annual Meeting*** (Nashville, Tennessee). Contact American Nuclear Society at 1-708-352-6611.
June 25-27	**Nuclear Power in A Changing World** (London, England). Contact British Nuclear Forum at telephone 071-828-0116, or facsimile 071-828-0110.
Sept. 4-7	***International Seminar on the Costs and Financing of Nuclear Power in Developing Countries*** (Jakarta, Indonesia). Contact Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.
Sept. 5-7	***Uranium Institute 15th Annual Symposium*** (London, England). Contact the UI at 44-1-225-0308.
Sept. 16-19	***Uranium Seminar '90*** (Hyatt Regency, San Antonio, Texas), sponsored by the USCEA. Contact the USCEA Conference Office at 1-202-293-0770.
Sept. 23-26	**AMC Mining Convention** (New Orleans, Louisiana). Contact American Mining Congress, Suite 300, 1920 N Street N.W., Washington, D.C. 20036, or facsimile 1-202-861-7535.
Sept. 23-28	***ENC '90 Congress & Exhibition*** (Lyon, France) organized by the European Nuclear Society in collaboration with the ANS and Foratom. Contact Dr. P. Feuz, European Nuclear Society at 31-21 61 11.
Oct. 14-16	***World Nuclear Fuel Market Annual Meeting*** (Toulouse, France). Contact Donna Cason at 1-404-447-1144.
Nov. 11-14	***Nuclear Energy Forum*** (Washington Hilton, Washington, D.C.), sponsored by the USCEA and ANS. Contact the USCEA Conference Office at 1-202-293-0770, or the ANS Meetings Department at 1-312-352-6611.
1991	
April 14-18	***Third International Conference on Nuclear Fuel Reprocessing & Waste Management*** (Sendai, Japan), sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, co-sponsored by the American Nuclear Society and the European Nuclear Society. Contact the Japan Atomic Industrial Forum at telephone 3-508-2411, or facsimile 3-508-2094.
May	***Second International Conference on Transportation for the Nuclear Industry*** (Bournemouth, England). Contact the Conference Secretary, The Institution of Nuclear Engineers, at 081-698 1500.

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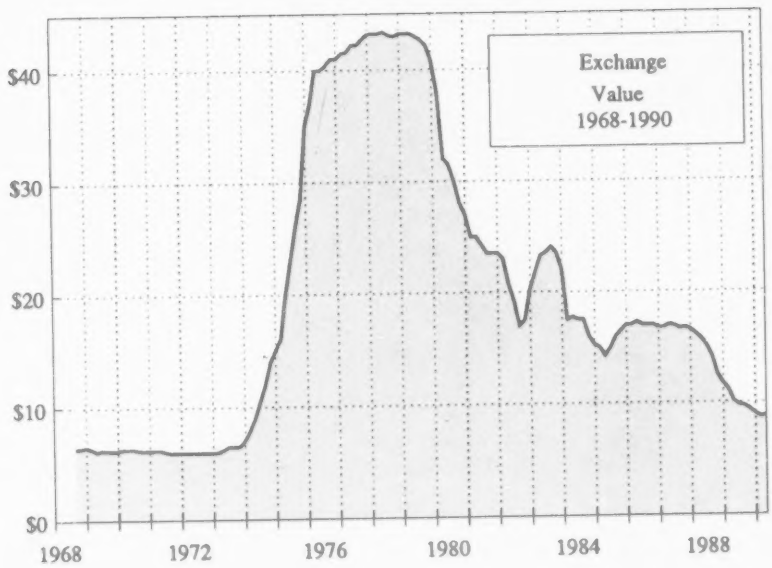
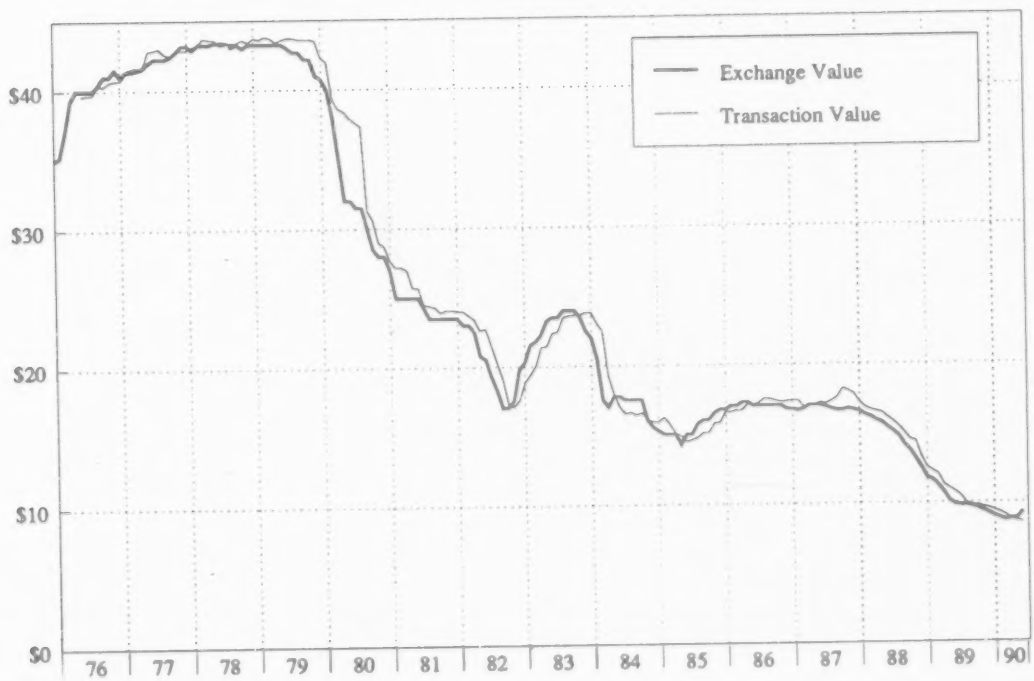
HISTORICAL MARKET DATA

NUEXCO Historical Exchange Value and Transaction Value
(In US Dollars per Pound Equivalent U_3O_8)





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HISTORICAL MARKET VALUES

EXCHANGE VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	**9.25**							

US PREMIUM (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF6 VALUES

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	**25.50**							

US UF6 PREMIUM (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

TRANSACTION VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	**8.55**							

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LOAN RATES

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	**3.50**							

* Float with Prime Rate

CONVERSION VALUES

Determined as of the last day of the month indicated ($US/lb U as UF_6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	**1.45**							

SWU VALUES

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	**50**							

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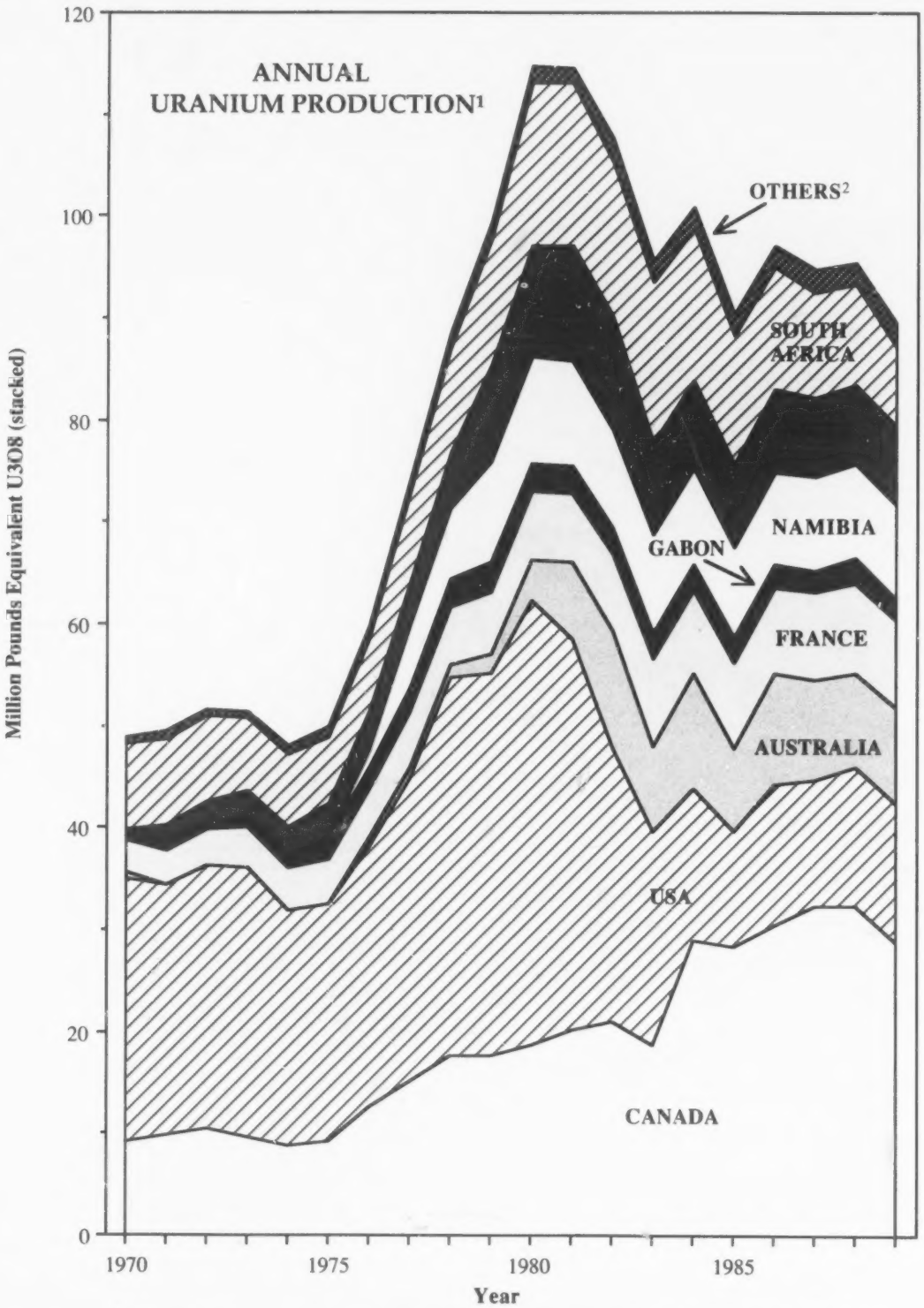
HISTORICAL MARKET DATA



[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Others** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, West Germany and Yugoslavia

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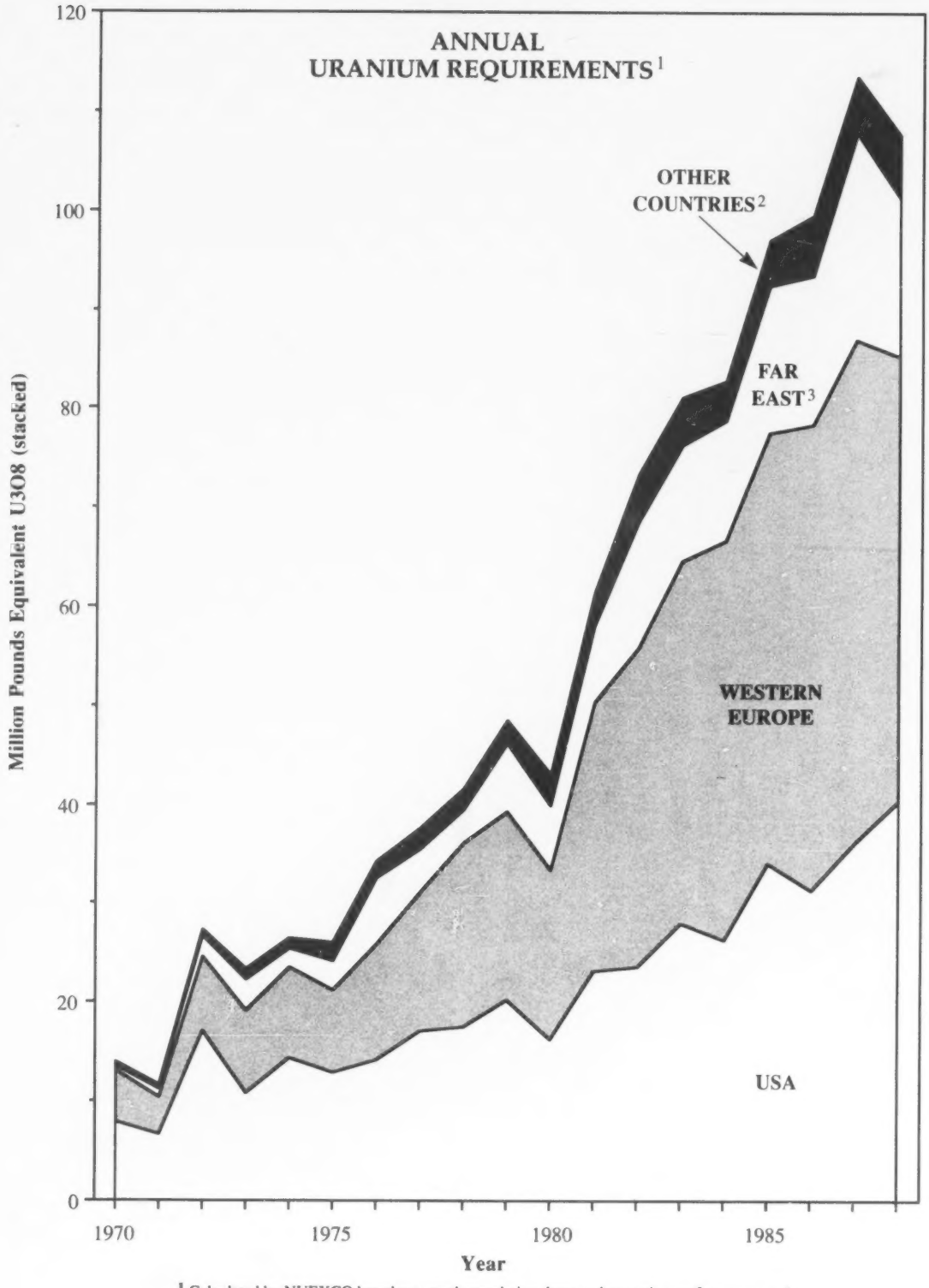

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other Countries** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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GOVERNMENT STATISTICS

AUSTRALIA

		Consumer Price Index[1] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[2] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia (Australian dollars)[6]	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[3] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[5]
1981	Avg.	105.0	85.9	—	154.1[5]
1982	Avg.	116.7	89.0	—	174.9[5]
1983	Avg.	128.5	96.9	—	181.9[5]
1984	Avg.	133.6	98.0	—	194.4[5]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	124.8
Jan	1989	—	110.6	—	122.2
Feb	1989	—	111.2	521.90	122.2
Mar	1989	188.0	114.9	—	123.1
Apr	1989	—	117.5	—	123.2
May	1989	—	118.6	530.40	123.7
June	1989	192.6	119.9	—	124.7
July	1989	—	120.1	—	126.2
Aug	1989	—	119.2	539.30	126.2
Sept	1989	197.0	117.7	—	126.3
Oct	1989	—	117.8	—	126.5
Nov	1989	—	118.0	547.00R	126.8
Dec	1989	200.7	118.2	—	126.8
Jan	1990	—	119.2	—	126.8
Feb	1990	—	120.8	—	127.2
Mar	1990	204.1	121.5	—	—

P = Preliminary R = Revised since last month

[1]Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 =100.0). Figures shown at end of quarter represent quarterly average.
[2]Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[3]Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[4]Monthly data for the period 1967 to 1986 appear in Report 233.
[5]Base: June 1976 = 100.
[6]Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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CANADA

		Industrial Products Price Index: All Commodities[1] (1981 = 100)	Consumer Price Index: All Items (1981 = 100)	Wage-earner Data: Average Hourly Earnings (C$)[2] Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells[3] (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	90.7	88.9	—	—	—	—	—
1981	Avg.	100.0	100.0	—	—	—	—	—
1982	Avg.	106.7	110.8	—	—	—	—	—
1983	Avg.	110.4	117.2	17.22	—	14.18	10.67	11.10
1984	Avg.	115.4	122.3	17.89	—	14.97	11.11	11.68
1985	Avg.	118.6	127.2	18.53	16.48	15.56	11.85	12.12
1986	Avg.	119.6	132.4	19.38	16.70	15.76	12.28	12.58
1987	Avg.	122.7	138.2	20.12	17.15	16.11	12.58	13.20
1988	Avg.	128.1	143.8	20.91	18.51	16.95	13.17	13.77
1989	Avg.	131.0	151.0	21.97	20.02	18.41	13.71	14.16
Jan	1989	130.7	146.8	21.22	19.45	18.14	13.75	13.82
Feb	1989	130.8	147.8	22.05	19.51	18.26	13.79	13.89
Mar	1989	131.3	148.5	21.90	19.65	18.35	13.62	14.10
Apr	1989	131.3	149.0	22.37	19.80	18.40	13.57	14.16
May	1989	131.4	150.5	21.89	20.02	18.17	13.76	14.27
June	1989	131.5	151.3	21.89	20.02	18.17	13.76	13.22
July	1989	131.4	152.3	21.67	19.60	17.96	13.57	12.98
Aug	1989	131.3	152.4	20.97	19.76	18.24	13.52	14.30
Sept	1989	131.0	152.6	21.97	20.61	18.73	13.68	14.83
Oct	1989	130.8	153.2	22.26	20.71	18.74	13.99	14.77
Nov	1989	130.6	153.7	22.60	20.64	18.78	13.93	14.75
Dec	1989	130.2	153.6	22.80	20.50	18.93	13.62	14.77
Jan	1990	130.4	154.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	131.3	155.8	22.51	20.63R	19.14R	14.49	15.03R
Mar	1990	131.6	156.3	22.52P	20.70P	19.17P	14.98P	15.10P
Apr	1990	131.4	156.4	—	—	—	—	—

P = Preliminary **R** = Revised since last month

[1]Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.
[2]Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.
[3]Reports 175 through 185 list this series title incorrectly as "Metal Mining, Including Milling (SIC 050-099)."

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GOVERNMENT STATISTICS

SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled (March 1982 = 100)[2]	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand)[5]
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,939
							Monthly Total
Jan	1989	—	—	166.8	165.5	714,593	704,320
Feb	1989	—	—	168.2	168.5	696,329	669,983
Mar	1989	112.29	262.8	170.9	171.1	702,746	695,843
Apr	1989	—	—	173.1	173.8	658,677	634,344
May	1989	—	—	175.9	176.4	706,056	721,263
June	1989	113.76	267.0	177.7	177.1	706,810	720,586
July	1989	—	—	179.3	178.8	711,648	775,002
Aug	1989	—	—	181.8	180.7	703,812	793,475
Sept	1989	119.76	280.2	183.4	181.7	708,222	780,723
Oct	1989	—	—	185.1	183.9	689,017	737,723
Nov	1989	—	—	187.0	185.6	704,025	790,375
Dec	1989	120.79	282.0	189.4	187.2	702,382	810,302
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	—	—
Mar	1990	126.74	296.3	196.4	190.9	—	—
Apr	1990	—	—	198.3	—	—	—

P = Preliminary R = Revised since last month

[1]Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.
[2]Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.
[3]Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.
[4]Central Statistical Service, Pretoria: All commodities for consumption in South Africa.
[5]Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.
[6]Annual total is shown, rather than monthly average for indicated year.

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UNITED STATES

		Producer Price Index[1]		Consumer Price	GNP Implicit Price	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Index[2] (1982-1984 = 100)	Deflator[3] (1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.7	13.09	13.22	12.67	10.13
1989	Avg.	111.6	112.2	124.0	126.6	13.67	13.75	13.06	10.38
Jan	1989	109.4	110.5	121.1	—	13.80	13.49	12.85	10.27
Feb	1989	110.1	110.8	121.6	—	13.66	13.48	12.88	10.26
Mar	1989	110.5	111.5	122.3	125.4	13.71	13.51	12.91	10.30
Apr	1989	111.8	112.3	123.1	—	13.68	13.65	12.92	10.31
May	1989	112.1	113.2	123.8	—	13.60	13.57	12.98	10.33
June	1989	112.4	112.9	124.1	126.0	13.62	13.66	12.98	10.37
July	1989	112.2	112.8	124.4	—	13.70	13.75	13.12	10.41
Aug	1989	111.4	112.0	124.6	—	13.64	13.72	13.08	10.40
Sept	1989	111.9	112.4	125.0	126.8	13.70	13.99	13.18	10.47
Oct	1989	112.4	112.8	125.6	—	13.76	13.94	13.25	10.43
Nov	1989	112.2	112.7	125.9	—	13.69	14.12	13.26	10.47
Dec	1989	112.3	113.0	126.1	128.0	13.51	14.16	13.31	10.52
Jan	1990	114.2	114.9	127.4	—	13.75	13.95	13.31	10.50
Feb	1990	113.6	114.4	128.0	—	13.75	13.98R	13.24R	10.54R
Mar	1990	113.2	114.2	128.7	129.7	13.78P	14.02P	13.29R	10.58P
Apr	1990	113.1	114.0	128.9	—	—	—	13.44P	10.58P

P = Preliminary R = Revised since last month

[1]US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2]US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3]US Department of Commerce, Washington, D.C.: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4]US Bureau of Labor Statistics, Washington, D.C.: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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GOVERNMENT STATISTICS

VOLUME AND PRICE OF URANIUM DELIVERIES TO THE EUROPEAN COMMUNITY[1]
(Compiled from data published by the Euratom Supply Agency)

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

R = Revised

[1] The twelve European Community member nations are Belgium, Denmark, France, West Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US URANIUM MARKETING ACTIVITIES STATISTICS
(Compiled from data published by the US Energy information Administration) [1]

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] ($/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	14.8	$19.14	1.0
1988	13.1	17.6	$25.65	15.8	$19.03	3.3

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*
1984-1988: Energy Information Administration, *Uranium Industry Annual*
[2] Data for 1976-1981 includes both domestic utilities and agents
[3] Includes imports by domestic utilities and domestic suppliers

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INTERNATIONAL ADVISORY COMMITTEE

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Canada

George J. Stathakis
USA

W. Bryan Webster
USA

Chris I. von Christierson
South Africa

Lars Halle
Sweden

James C.C. Stewart
United Kingdom

REPRESENTATIVES

JAPAN:

Kazuo Yokota
Japan Tech Services
Ohkura Building (3F)
1–4–10 Shiba Daimon
Minato-ku, Tokyo, Japan
Telephone: (81-3) 431-6031, 6025
Telefax: (81-3) 434-6674
Telex: 242-5060 (JATECH J)

SOUTH AFRICA:

Chris I. Von Christierson
Southern Prospecting (Pty) Limited
Mailing Address:
Post Office Box 61409
Marshalltown 2107
Republic of South Africa
Street Address:
7th Floor, Marshall Place
66 Marshall Street
Johannesburg 2001
Telephone: (27-11) 834-4211
Telefax: (27-11) 834-6343
Telex: 4-89878-SA

TAIWAN:

Dr. Steve H.K. Wang
Southeast Engineering Corporation
Yu-Ming Mansion
7, Roosevelt Rd., Sec. 1, 7th Floor
Taipei, 10757, Taiwan R.O.C.
Telephone: (886-2) 321-0216
Telefax: (886-2) 394-2621
Telex: 11285 (SENCORP)

UNITED STATES:

Harold C. Lindberg
83-A Hardee Lane
Whispering Pines, North Carolina 28327
Telephone: (919) 949-3622
Telefax: (919) 949-2626

Ralph O. Smith
141 Braemar Drive
Cheshire, Connecticut 06410
Telephone: (203) 272-6246
Telefax: (203) 271-1346

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INTERNATIONAL HEADQUARTERS

Three Park Central, Suite 900
1515 Arapahoe Street
Denver, Colorado 80202 USA

Telephone: (303) 899-4500
Telefax: (303) 899-4555
Telex: 450202/NUEXCO